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SIDE PROTECTION IN 2-DOOR AND 4-DOOR PRODUCTION VEHICLES MDB-TO-CAR SIDE IMPACT TEST OF A 26° CRABBED MOVING DEFORMABLE BARRIER TO A 1981 CHEVROLET CITATION AT 33.5 MPH

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16. Abstract

This test report documents one of a series of thirteen crash tests to evaluate side impact protection in various vehicle models. Testing was conducted on a 1981 Chevrolet Citation 4-door hatchback at the TRCO Crash Test Facility, East Liberty, Ohio. The test vehicle was impacted on the left side by a moving deformable barrier, crabbed to 26°, at 33.5 mph. Occupant responses of two side impact dummies were measured. One dummy was located in the driver's designated seating position and one was located in the left rear seating position. The test date was December 19, 1983 and the ambient temperature was 10°F.

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SECTION 1.0
PURPOSE AND INTRODUCTION

PURPOSE

The main purpose of this test was to evaluate side impact protection in one of a fleet of 2-door and 4-door vehicles. The vehicle was tested using conditions not currently contained in a Federal Motor Vehicle Safety Standard.

INTRODUCTION

A stationary 1981 Chevrolet Citation 4-door hatchback was impacted on the left side by a Moving Deformable Barrier (MDB) on December 19, 1983. The test was to simulate an intersection collision with the striking vehicle traveling at 30 mph and the struck vehicle traveling at 15 mph. The orientation angle of the striking vehicle was 90^{o} counterclockwise with respect to the longitudinal axis of the struck vehicle. The leading edge of contact was to be 37 inches forward of the vehicle center of gravity which is defined by accident investigation to be the midpoint of the wheelbase.

To simulate this collision, the MDB was to be towed into the stationary Chevrolet Citation at 33.5 mph with the MDB's wheels crabbed clockwise to 26^{o}. The actual test speed was 33.5 mph and the actual leading edge of contact was 37. inches forward of the midpoint of the Chevrolet Citation's wheelbase.

The vehicle was a baseline model with no structural modification. The driver door and left rear door were unpadded.

Section 2 contains General Test and Vehicle Parameter Data. Section 3 contains data required by R & D. Appendix A contains pre-test and post-test vehicle and dummy photographs. Appendix B contains Data Plots. Appendix C contains Dummy Certification Data.

SECTION 2.0

GENERAL TEST AND VEHICLE PARAMETER DATA

The following data sheets describe the General Test and Vehicle Parameter Data.

TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: General Motors Corporation

MAKE/MODEL: Chevrolet Citation VIN: 1G1AX6857B6246605

BODY STYLE: 4-Door Hatchback MODEL YEAR: 1981

NHTSA NO.: R & D COLOR: Dark Blue Metallic

ENGINE DATA: TYPE: Transverse CYLINDERS: 4 DISPLACEMENT 2500 CC

TRANSMISSION DATA: 4 Speed Manual

DATE VEHICLE RECEIVED: 11/06/81 ODOMETER READING: 95.5

DEALER'S NAME AND ADDRESS: Daring Chevrolet Cadillac

ACCESSORIES:

POWER STEERING	Yes	AUTOMATIC TRANSMISSION	No
POWER BRAKES	Yes	AUTOMATIC SPEED CONTROL	No
POWER SEATS	No	TILTING STEERING WHEEL	No
POWER WINDOWS	No	TELESCOPING STEERING WHEEL	No
TINTED GLASS	No	AIR CONDITIONING	No
RADIO	No	ANTI-SKID BRAKE	No
CLOCK	No	REAR WINDOW DEFROSTER	No
OTHER			

REMARKS:

1. IS THE VEHICLE STOCK THROUGHOUT? Yes
2. DOES VEHICLE SHOW EVIDENCE OF PRIOR ACCIDENT HISTORY? No
3. DOES VEHICLE SHOW ANY SIGNIFICANT CORROSION? No
4. CONDITION OF THE FRONT/REAR BUMPER AND FRAME: Good

DATA FROM CERTIFICATION LABEL ON LEFT DOOR FACE OR "B" POST:

VEHICLE MANUFACTURED BY: General Motors Corporation

DATE OF MANUFACTURE: 4/81

GVWR: 3470 LBS.,

GAWR: FRONT 1847 LBS., REAR 1623 LBS.

VEHICLE TIRE DATA

RECOMMENDED COLD TIRE PRESSURE: FRONT 30 psi; REAR 30 psi

TIRES ON VEHICLE (MFGR. & LINE, SIZE): Goodyear Viva Radial P185/80R13

BIAS PLY, BELTED, OR RADIAL: Radial

PLY RATING: 3

IS SPARE TIRE "SPACE SAVER"? Yes

IS SPARE TIRE STANDARD EQUIPMENT? Yes

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (WITH MAXIMUM FLUIDS):

RIGHT FRONT	756	LBS.	RIGHT REAR	496 LBS.
LEFT FRONT	836	LBS.	LEFT REAR	464 LBS.
TOTAL FRONT WEIGHT	1592	LBS. (62.4 % OF TOTAL VEHICLE WEIGHT)		
TOTAL REAR WEIGHT	960	LBS. (37.6 % OF TOTAL VEHICLE WEIGHT)		
TOTAL DELIVERED WEIGHT	2552	LBS.		

VEHICLE ATTITUDE (ALL DIMENSIONS IN INCHES):

DELIVERED ATTITUDE:	RF 28 9/16	;LF 27 7/8	;RR 27 1/2	;LR 27 1/4
PRE-TEST ATTITUDE:	RF 27 7/16	;LF 27 5/16	;RR 24 9/16	;LR 24 3/16
POST-TEST ATTITUDE:	RF 25 5/8	;LF 27 9/16	;RR 22 7/8	;LR 24 1/8

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 160 LBS. CARGO:

RIGHT FRONT	800	LBS.	RIGHT REAR	690 LBS.
LEFT FRONT	910	LBS.	LEFT REAR	660 LBS.
TOTAL FRONT WEIGHT	1710	LBS. (55.9 % OF TOTAL VEHICLE WEIGHT)		
TOTAL REAR WEIGHT	1350	LBS. (44.1 % OF TOTAL VEHICLE WEIGHT)		
TOTAL TEST WEIGHT	3060	LBS.		

WEIGHT OF BALLAST SECURED IN VEHICLE TRUNK AREA: 0 LBS.

TEST FLUID DATA

TEST FLUID TYPE: RED STODDARD SOLVENT #2; SPEC. GRAVITY: 0.764

KINEMATIC VISCOSITY: 0.99 CENTISTOKES

"USEABLE" CAPACITY*: NA GALLONS

TEST VOLUME: 1.0 GALLONS

FUEL SYSTEM CAPACITY (DATA FROM OWNERS MANUAL): 14.0 GALLONS

DETAILS OF FUEL SYSTEM: DNA

ELECTRIC FUEL PUMP: No FUEL INJECTION: No

DOES ELECTRIC FUEL PUMP OPERATE WITH IGNITION SWITCH "ON" AND THE ENGINE NOT OPERATING?

DATA FROM "RECOMMENDED TIRE PRESSURE" LABEL ON DOOR, POST, GLOVEBOX, ETC.

VEHICLE LOAD (UP TO CAPACITY): FRONT 30 psi; REAR 30 psi

RECOMMENDED TIRE SIZE: P185/80 R 13 LOAD RANGE X B, C,

VEHICLE CAPACITY: TYPES OF SEATS: Bench

NUMBER OF OCCUPANTS (DESIGNATED SEATING CAPACITY): 2 FRONT
3 REAR
5 TOTAL

CARGO LOAD 145 LBS.

TOTAL 895 LBS.

*WITH ENTIRE FUEL SYSTEM FILLED WITH FUEL TANK THROUGH CARBURETOR BOWL.

TEST CONDITIONS

TEST NUMBER: 831219

DATE OF TEST: December 19, 1983 TIME OF TEST: 13:20

WIND VELOCITY: 5-10 mph 342° NW HUMIDITY: NA

AMBIENT TEMPERATURE AT IMPACT AREA: 10° F

TEMPERATURE IN OCCUPANT COMPARTMENT: 78° F

SUBJECT VEHICLE DATA

	ACTUAL	INTENDED
VEHICLE TEST WEIGHT (LBS.)	3060	3045
MDB TEST WEIGHT (LBS.)	2990	3000
MDB VELOCITY (MPH)*	33.5	33.5
IMPACT POINT (INCHES)**	37.	37

DUMMIES

	DRIVER	MIDDLE PASSENGER	RT. FRONT PASSENGER	LEFT REAR PASSENGER	RT. REAR PASSENGER
TYPE:	SID			SID	
SERIAL NO.:	06			U02	
INSTRUMENTATION:					
HEAD ACCEL.:	Yes			Yes	
CHEST ACCEL.:	Yes (Upper/Lower)			Yes (Upper/Lower)	
FEMUR L.C.'S:	No			No	
OTHER:	Pelvis/Ribs			Pelvis/Ribs	

RESTRAINT SYSTEM: Both dummies were unrestrained

* As measured over final one foot of travel.

** As measured forward of the midpoint of the Citation's wheelbase.

VISIBLE DUMMY CONTACT POINTS:

	DRIVER 06	PASSENGER U02
Head	Side Window	Side Header
Chest	Driver's Door Panel	Left Rear Door Panel
Abdomen	Driver's Door Panel	Left Rear Door Panel
Left Knee	Driver's Door Panel	Left Rear Door Panel
Right Knee	Left Knee	Left Knee

DOOR OPENING:

	LEFT	RIGHT
Front	Tools Required	Easy
Rear	Tools Required	Easy

SEAT MOVEMENT:

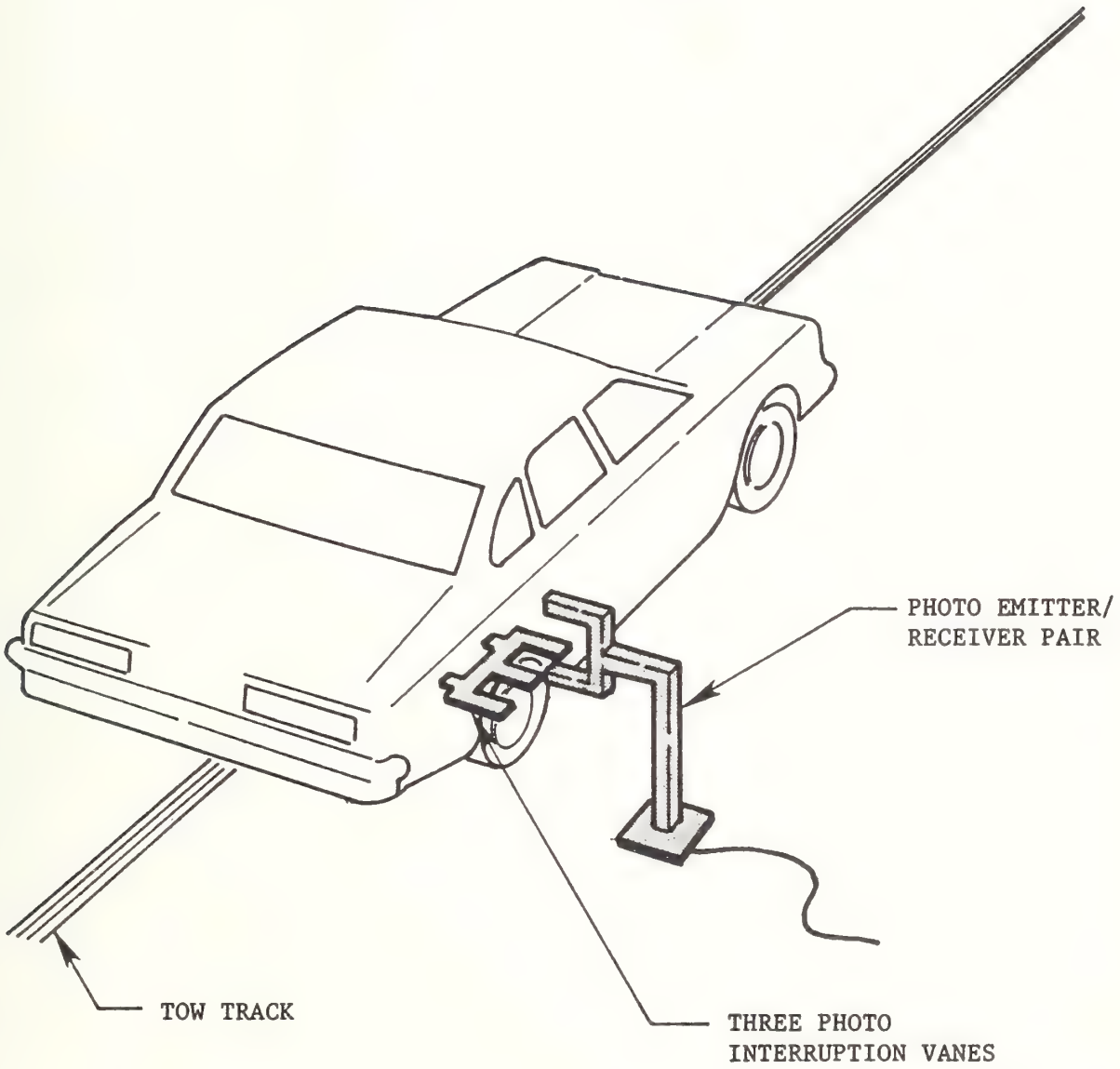
	SEAT BACK FAILURE	SEAT SHIFT
Front	No	Yes
Rear	No	Yes

GLAZING DAMAGE: Left side of windshield cracked, all left side windows shattered, no backlight damage.

OTHER NOTABLE IMPACT EFFECTS:

Both bench seats buckled upward along vehicle centerline.

IMPACT VELOCITY MEASUREMENT SYSTEM



The final vane is located two inches before impact.

The vanes have one foot spacing.

VEHICLE TEST WEIGHT CALCULATION

Test Weight = Unloaded Delivered Weight +
Number of Dummies X 174 lbs. +
Cargo Weight
= 2552 + 2 X 174 + 145 lbs.
= 3045 lbs.

To achieve test weight, the exhaust system and battery were removed and 1 gallon of Stoddard Solvent was added in the fuel tank. The weight of the test vehicle was measured by placing each wheel on a Loadmeter Corporation Hiway Loadometer.

TEST ANOMALIES

1) One 6 volt cell of a 30 volt battery assembly that powers the MDB onboard cameras shorted down so that both cameras (#3 and #4) received insufficient voltage for proper operation. Camera #3, which was located on the left hand side of the MDB, ran at a very slow rate and contained no usable footage. Camera #4, which was located centrally on the MDB ran at a very erratic rate but footage from this camera was included as test film.

2) Data channel TO1YGC - Passenger Upper Spine Acceleration #2 Y Axis contained an anomalous spike at approximately 23 msec. This spike does not correlate with the primary upper spine data channel (TO1YG3). Peak levels, resultant and delta velocity using this channel are suspect.

3) Pin separation occurred in data channel LFDYG2 - Vehicle Left Front Door (Position 8) Acceleration Y Axis at approximately 62 msec.

SECTION 3.0

DATA REQUIRED BY R&D

The following pages are included in this section:

1. Dummy temperature control and positioning data
2. Dummy kinematic summary
3. Vehicle crush data
4. Dummy and vehicle accelerometer location and data summary
5. High speed camera information
6. Transducer information

DUMMY TEMPERATURE CONTROL AND POSITIONING

The vehicle was kept inside the temperature controlled crash test building until approximately 2 hours prior to the test. Temperature inside the vehicle and ambient temperature at the crash area were recorded. Dummy temperature while outside the crash test building was maintained portably until approximately 1 minute prior to the test.

The following table summarizes the steps taken to position the instrumented, calibrated dummies in the test vehicle.

DUMMY PLACEMENT AND POSITIONING

SIDE IMPACT DUMMY*	DRIVER DSP	REAR PASSENGER DSP
HEAD	Surface of transverse instrument mounting platform is as horizontal as possible without inducing torso movement & midsagittal plane falls in longitudinal plane.	Surface of transverse instrument mounting platform is as horizontal as possible without inducing torso movement & midsagittal plane falls in longitudinal plane.
UPPER TORSO	Placed against seat back. Midsagittal plane is vertical and centered behind steering column.	Placed against seat back. Midsagittal plane is vertical and contained in the same longitudinal plane as the driver's midsagittal plane.
LOWER TORSO	Midsagittal plane is vertical and centered behind steering column.	Midsagittal plane is vertical and contained in the same longitudinal plane as the driver's midsagittal plane.
UPPER LEGS (thighs or femurs)	Placed against seat cushion. Planes defined by femur and tibia centerlines are as close as possible to vertical.	Placed against seat cushion. Planes defined by femur and tibia centerlines are as close as possible to vertical.
KNEES	Knees set 14.5" apart between pivot bolt head outer surfaces. Outer surface of right knee pivot bolt is 8.6" from midsagittal plane of dummy. Outer surface of left knee pivot bolt is 5.9" from midsagittal plane of dummy.	Located so that planes defined by femur and tibia centerlines are as close as possible to vertical.
LOWER LEGS	Plane defined by femur and tibia centerlines are as close as possible to vertical longitudinal plane.	Plane defined by femur and tibia centerlines are as close as possible to vertical longitudinal plane.
RIGHT FOOT	Placed on undepressed accelerator pedal -- rearmost point of heel on floorpan in plane of pedal.	Centerline falls in vertical longitudinal plane. Placed on floor as far forward as possible without front seat interference.
LEFT FOOT	Placed on toeboard -- rearmost point of heel on floorpan as close as possible to intersection of toeboard and floorpan. Centerline falls in vertical longitudinal plane.	Centerline falls in vertical longitudinal plane. Placed on floor as far forward as possible without front seat interference.

*NOTE: THE SIDE IMPACT DUMMY DOES NOT INCLUDE ARMS.

DUMMY IN-VEHICLE POSITION RECORDING SHEET

VEHICLE NHTSA NO. R & D

MFR./MAKE/MODEL: Chevrolet Citation

FRONT SEAT TYPE: X BENCH
____ BUCKET
____ SPLIT BENCH

ADJUSTER TYPE: X MANUAL
____ POWER

BUCKET SEAT BACK TYPE: ____ FIXED
____ ADJUSTABLE

TECHNICIANS:
1. B. Miller
2. D. LeVally
3.

POSITIONING DATE: 12/19/83

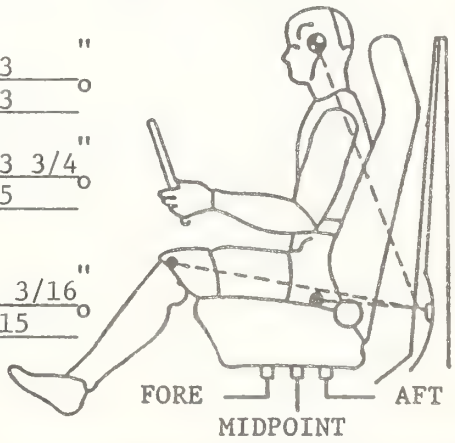
AMBIENT TEMP.: 68° F. TIME: 8:15

DRIVER DUMMY # 06

HEAD 23 "
TARGET* 3 °

KNEE 23 3/4 "
JOINT 95 °

APPROX.
"H" 9 3/16 "
POINT 115 °

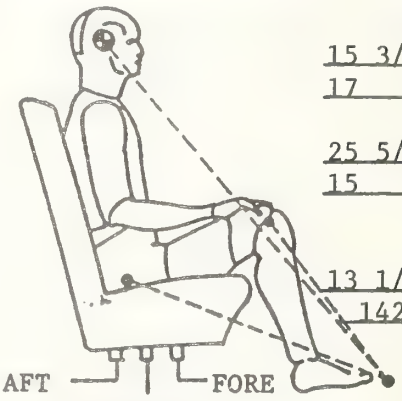


REAR PASSENGER DUMMY # U02

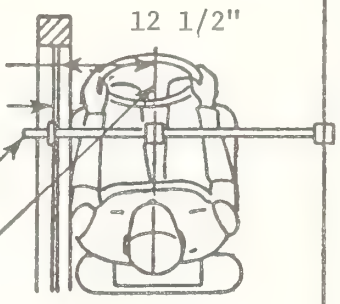
15 3/16 "HEAD
17 °TARGET**

25 5/8 "KNEE
15 °JOINT

APPROX.
13 1/4 " "H"
142 °POINT

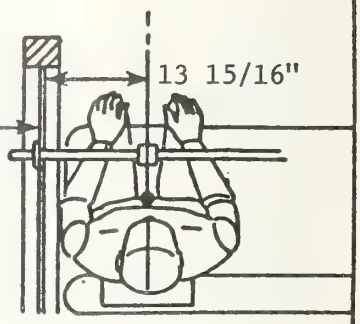


DOOR
GLASS
HEIGHT*** 11 1/8"



DRIVER
DUMMY #
06

DOOR
GLASS
HEIGHT 10 1/2"

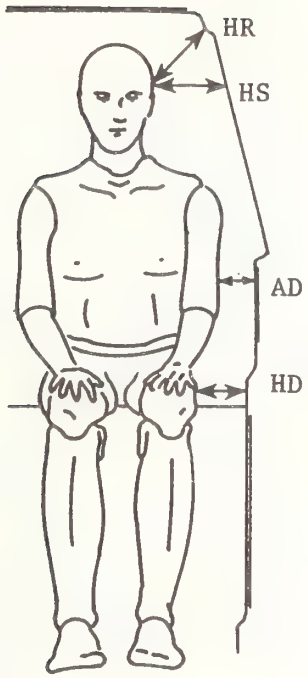


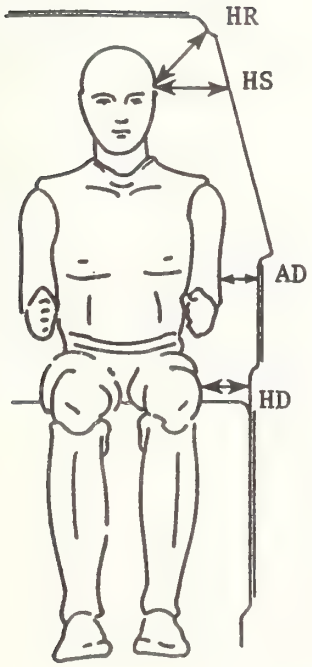
PASSENGER
DUMMY #
U02

*All driver dummy dimensions referenced to top of striker bolt and all angles referenced to vertical.

**All passenger dummy dimensions referenced to top of rear seat striker bolt (not as shown) and all angles referenced to vertical.

***Door glass height is set equal to the dummy nose level.

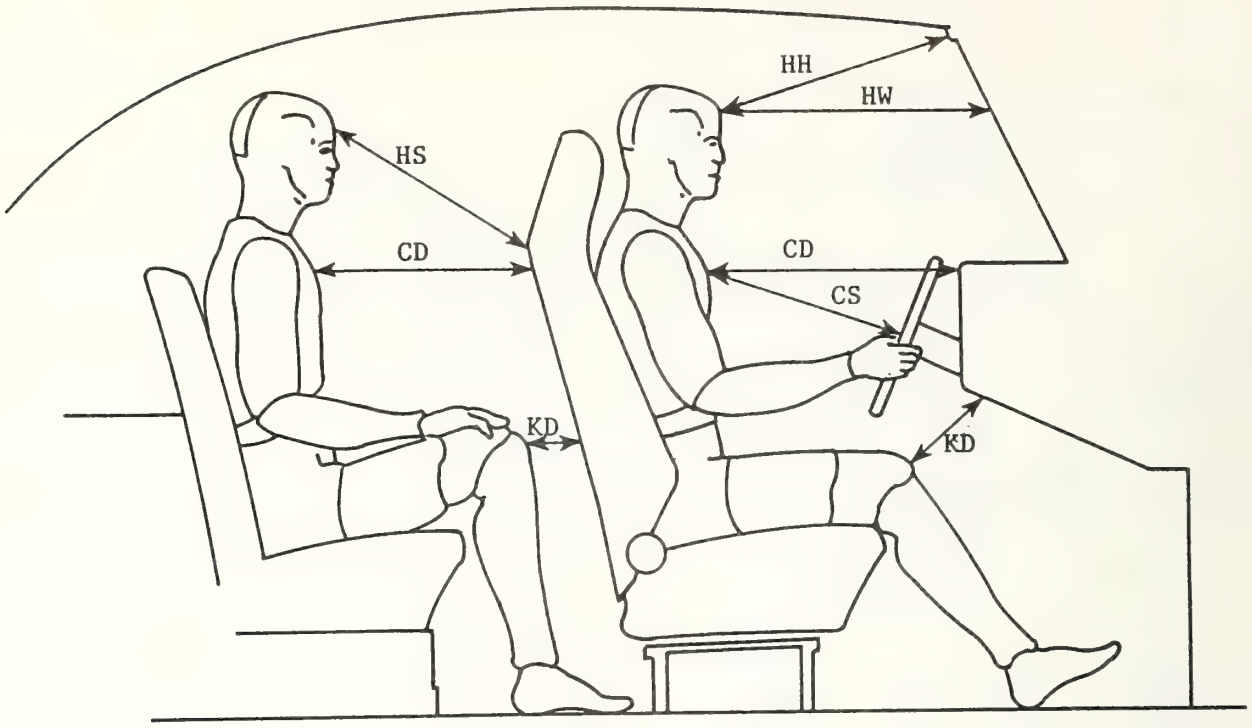




	DRIVER 06	PASSENGER U02
HR	5 13/16	7 1/4
HS	8 1/16	8 1/4
AD	4 1/4	5 7/16
HD	6 5/16	7 3/16

ALL MEASUREMENTS IN INCHES

DUMMY LATERAL CLEARANCE DIMENSIONS



	DRIVER 06	PASSENGER U02
HH	12 1/8	DNA
HW	17 1/8	DNA
HS	DNA	21
CD	21 5/8	19 1/8
CS	13 9/16	DNA
KDL	6 1/2	5 7/8
KDR	6 13/16	5 3/16

ALL MEASUREMENTS IN INCHES

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

DUMMY KINEMATIC SUMMARY

DRIVER

During impact, the dummy's torso contacted the driver's door and the head contacted the driver's side window. The dummy rebounded across the vehicle; the buttocks struck the front passenger's door and the head struck the side header. The dummy came to rest laying across the front passenger's seat on it's left side and facing the driver's side.

PASSENGER

During impact, the dummy's torso contacted the left rear passenger's door and the head contacted the side header. The dummy rebounded laterally across the vehicle; the right side struck the right rear passenger's door and the head struck the side header. The dummy came to rest setting upright in the right rear passenger's seat facing forward.

VEHICLE EXTERIOR PROFILES AND STATIC CRUSH

ZERO DISTANCE AT PROJECTED IMPACT POINT*

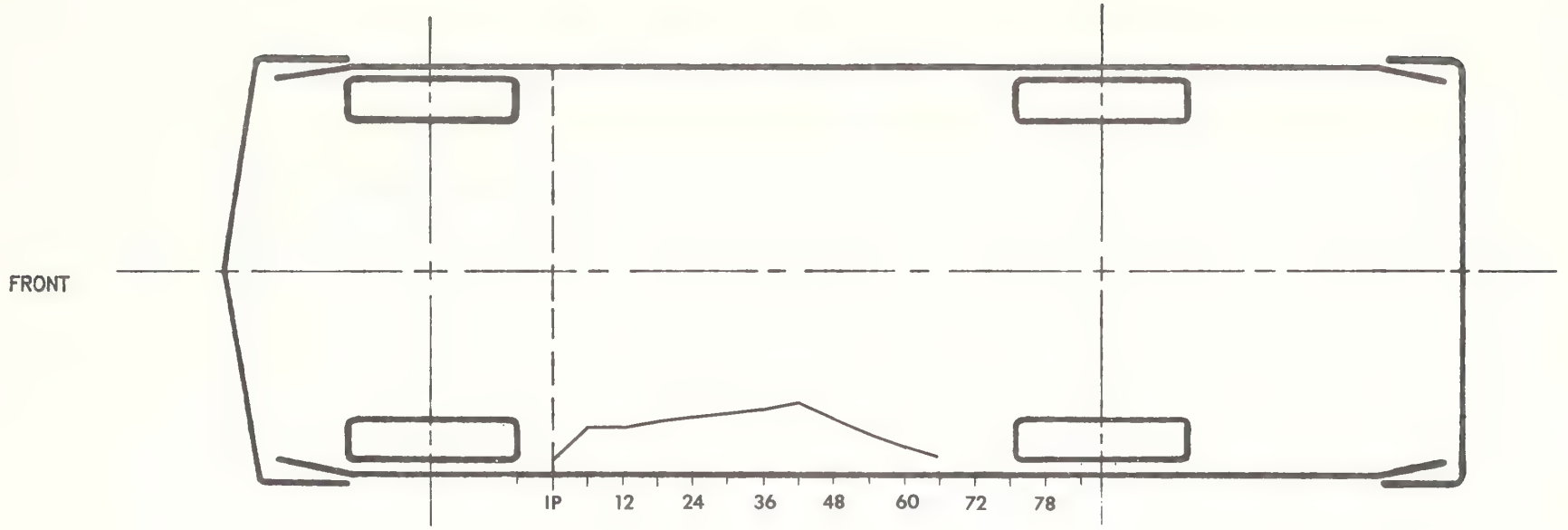
LOCATION	HEIGHT (in)	6	0	6	12	18	24	30	36	42	48	54	60	66	72	78
PRE-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)																
Axle Height	10.0	X	15.9	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.3	15.3	15.3	X	X
H-Point	20.0	X	13.3	13.3	13.1	13.1	13.0	12.9	12.9	12.9	12.9	13.0	13.0	13.0	13.1	X
Mid Door***	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Window Sill	33.0	15.5	15.4	15.3	15.3	15.1	15.1	15.1	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Window Top	52.5	X	X	X	X	X	23.8	23.1	23.1	23.1	23.1	23.1	23.2	23.2	23.3	23.9
POST-TEST PROFILE (DISTANCE IN INCHES FROM REFERENCE PLANE**)																
Axle Height	10.0	X	18.5	22.9	23.4	24.3	25.0	25.8	26.6	27.8	24.5	22.1	19.9	18.0	X	X
H-Point	20.0	X	16.6	23.1	23.9	24.5	25.1	25.4	25.9	26.6	27.5	28.7	29.1	29.9	27.2	X
Mid Door***	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Window Sill	33.0	17.6	17.7	21.2	21.8	23.9	24.4	24.7	25.4	25.9	27.0	27.3	27.8	27.1	22.3	18.1
Window Top	52.5	X	X	X	X	X	26.8	26.6	27.1	27.6	28.3	27.9	27.1	26.6	26.3	26.2
STATIC CRUSH (IN)																
Axle Height	10.0	X	2.6	7.5	8.0	8.9	9.6	10.4	11.2	12.4	9.1	6.8	4.6	2.7	X	X
H-Point	20.0	X	3.3	9.8	10.8	11.4	12.1	12.5	13.0	13.7	14.6	15.7	16.1	16.9	14.1	X
Mid Door***	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Window Sill	33.0	2.1	2.3	5.9	6.5	8.8	9.3	9.6	10.4	10.9	12.0	12.3	12.8	12.1	7.3	3.1
Window Top	52.5	X	X	X	X	X	3.0	3.5	4.0	4.5	5.2	4.8	3.9	3.4	3.0	2.3

* Projected impact point is 37 inches forward of driver's side wheelbase midpoint. Column readings are front to rear from left to right.

** Reference plane is parallel to and 48 inches from the vehicle longitudinal centerline.

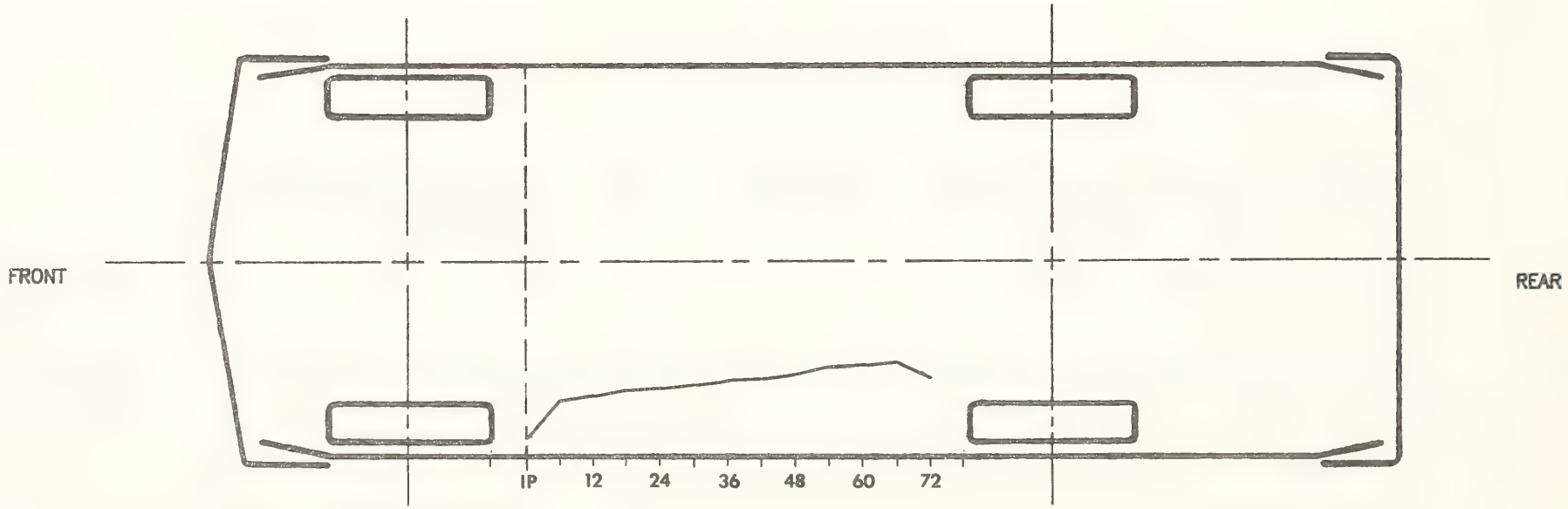
*** The Mid Door and H-Point heights are within two inches; only H-Point crush is reported.

VEHICLE EXTERIOR STATIC CRUSH PROFILE



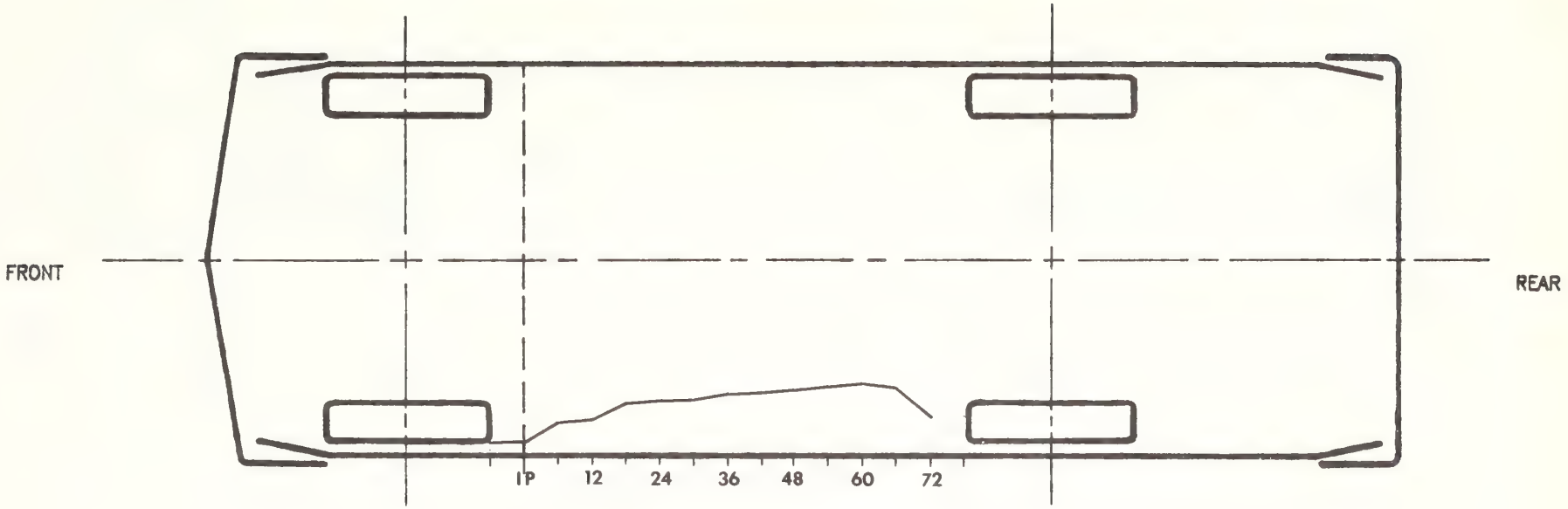
PROFILE LEVEL EQUALS AXLE HEIGHT
IP EQUALS PROJECTED IMPACT POINT

VEHICLE EXTERIOR STATIC CRUSH PROFILE



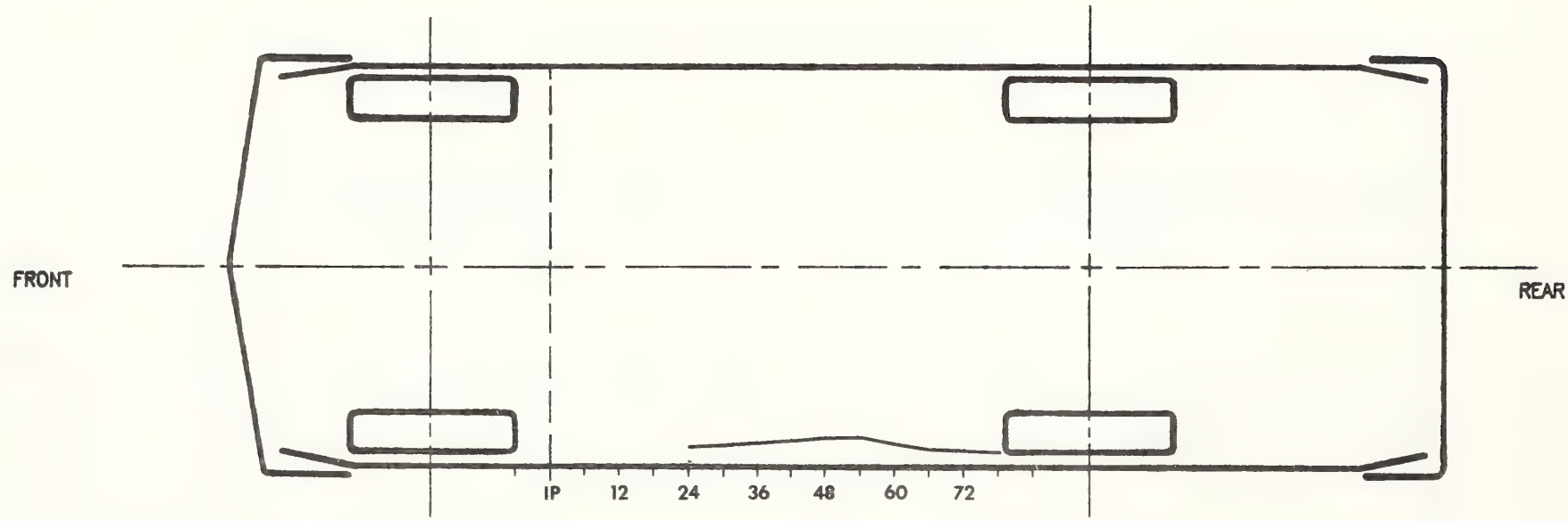
PROFILE LEVEL EQUALS H-POINT HEIGHT
IP EQUALS PROJECTED IMPACT POINT

VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS WINDOW SILL HEIGHT
IP EQUALS PROJECTED IMPACT POINT

VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS WINDOW TOP HEIGHT
IP EQUALS PROJECTED IMPACT POINT

SIDE IMPACT DUMMY DATA SUMMARY

	DRIVER DUMMY				PASSENGER DUMMY			
	POSITIVE DIRECTION*		NEGATIVE DIRECTION**		POSITIVE DIRECTION*		NEGATIVE DIRECTION**	
	MAX (g)	TIME (msec)	MAX (g)	TIME (msec)	MAX (g)	TIME (msec)	MAX (g)	TIME (msec)
HEAD ACCELERATION								
LONGITUDINAL	6.90	44.88	21.04	72.75	16.46	242.75	23.88	54.88
LATERAL	82.53	45.38	12.75	33.75	204.50	54.38	23.18	39.00
VERTICAL	50.13	50.88	34.08	68.88	104.32	53.63	23.07	39.75
RESULTANT		85.32 @ 45.38				222.17 @ 54.63		
HIC	350.00 from 41.75 to 52.88				1490.23 from 53.13 to 56.50			
CHEST ACCELERATION								
UPPER SPINE								
LONGITUDINAL	26.76	51.25	35.99	63.75	21.28	54.38	28.12	46.25
LATERAL (P)***	77.87	41.87	52.29	63.13	101.33	44.38	23.39	35.63
LATERAL (R)***	76.98	41.87	45.46	63.13	125.88	27.50 γ	40.76	32.50 γ
VERTICAL	9.11	32.50	20.45	40.63	7.54	31.25	15.09	65.63
RESULTANT (P)		80.33 @ 41.87				104.21 @ 44.38		
RESULTANT (R)		79.47 @ 41.87				125.91 @ 27.50γ		
DELTA V (MPH)****		26.0 @ 60.00 (P)				21.3 @ 124.38 (P)		
		26.7 @ 60.00 (R)				33.3 @ 124.38 (R) γ		
LOWER SPINE								
LONGITUDINAL	52.95	40.00	29.37	34.38	35.41	48.75	32.46	61.87
LATERAL (P)	102.94	33.75	35.27	63.13	88.10	36.25	32.22	60.62
LATERAL (R)	101.27	33.75	52.00	62.50	87.79	36.25	30.74	61.25
VERTICAL	33.64	62.50	49.50	121.87	32.27	41.25	8.32	66.25
RESULTANT (P)		108.45 @ 33.75				89.48 @ 36.25		
RESULTANT (R)		106.87 @ 33.75				89.17 @ 36.25		
DELTA V (MPH)		31.4 @ 52.50 (P)				27.3 @ 57.50 (P)		
		30.7 @ 52.50 (R)				27.5 @ 57.50 (R)		
LEFT UPPER RIB								
LATERAL (P)	88.87	38.13	11.84	44.38	85.64	40.00	9.38	66.87
LATERAL (R)	93.67	37.50	9.83	43.75	78.64	40.00	14.54	52.50
DELTA V (MPH)		24.5 @ 74.38 (P)				23.4 @ 108.13 (P)		
		25.5 @ 75.63 (R)				24.5 @ 141.25 (R)		
LEFT LOWER RIB								
LATERAL (P)	86.01	36.25	36.23	68.13	120.31	38.75	31.55	66.87
LATERAL (R)	90.28	36.25	35.08	68.13	135.23	39.38	38.33	66.25
DELTA V (MPH)		25.4 @ 79.38 (P)				24.4 @ 63.13 (P)		
		26.2 @ 79.38 (R)				25.3 @ 63.13 (R)		
PELVIS ACCELERATION								
LONGITUDINAL	12.65	44.63	12.86	48.13	12.95	42.50	77.02	35.13
LATERAL	170.92	33.13	10.07	66.13	160.71	32.13	15.44	24.63
VERTICAL	22.67	40.75	10.07	49.50	29.40	38.25	6.65	29.50
RESULTANT		171.24 @ 33.13				164.14 @ 32.25		
DELTA V (MPH)		29.4 @ 56.63				28.0 @ 42.88		

SIDE IMPACT DUMMY DATA SUMMARY CONTD

	DRIVER DUMMY				PASSENGER DUMMY			
	POSITIVE DIRECTION*		NEGATIVE DIRECTION**		POSITIVE DIRECTION*		NEGATIVE DIRECTION**	
	MAX (in)	TIME (msec)	MAX (in)	TIME (msec)	MAX (in)	TIME (msec)	MAX (in)	TIME (msec)
RIB DEFLECTION †	0.02	292.63	1.78	62.50	0.04	30.25	1.35	60.25

* LONGITUDINAL:	FORWARD	**LONGITUDINAL:	REARWARD
LATERAL:	RIGHTWARD	LATERAL:	LEFTWARD
VERTICAL:	UPWARD	VERTICAL:	DOWNWARD

*** (P) = Primary Sensor, (R) = Redundant Sensor

**** For dummy channels, Delta V is the velocity change at the approximate time of separation from the contact area.

† Compression: Negative

ϒ SEE TEST ANOMALIES

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

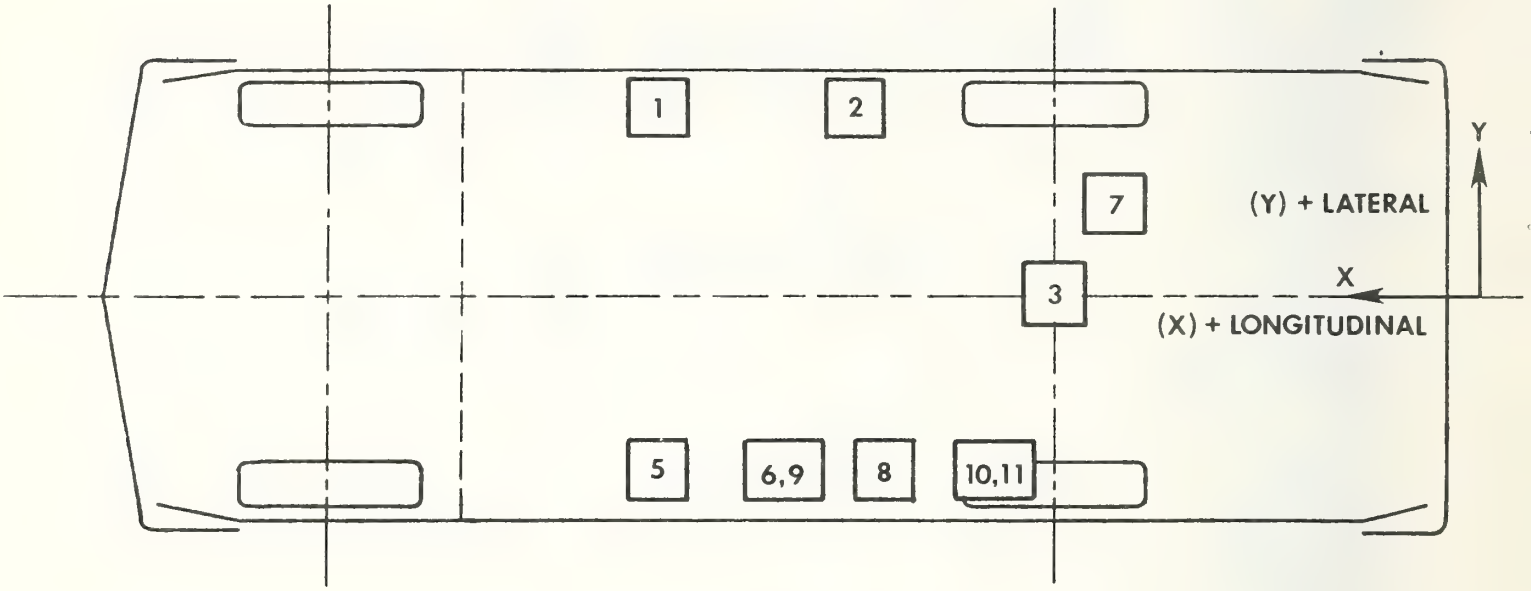
NO.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION MAX (g)	POSITIVE DIRECTION TIME (msec)	NEGATIVE DIRECTION MAX (g)	NEGATIVE DIRECTION TIME (msec)
1	RIGHT SILL AT FRONT SEAT	104.6	26.3	9.6				
	(LONGITUDINAL)	Δ V = -1.5 mph @ 120.00 msec			2.85	58.25	10.59	20.75
	(LATERAL)	Δ V = 14.4 mph @ 120.00 msec			22.56	45.38	7.65	84.63
	(VERTICAL)				4.75	61.75	4.61	54.13
	(RESULTANT)					22.58 @ 45.38		
2	RIGHT SILL AT REAR SEAT	73.4	26.6	9.5				
	(LONGITUDINAL)	Δ V = -0.1 mph @ 120.00 msec			3.80	58.25	9.70	20.88
	(LATERAL)	Δ V = 22.4 mph @ 120.00 msec			19.49	47.00	1.76	86.38
	(VERTICAL)				11.49	26.88	8.27	51.25
	(RESULTANT)					20.33 @ 47.38		
3	REAR DECK OVER AXLE	37.5	-0.0	35.9				
	(LONGITUDINAL)	Δ V = -1.5 mph @ 120.00 msec			7.91	41.25	11.99	21.88
	(LATERAL)	Δ V = 19.7 mph @ 120.00 msec			19.06	23.88	3.32	166.75
	(VERTICAL)				7.29	43.00	8.25	31.25
	(RESULTANT)					22.70 @ 23.00		
4	LEFT SILL AT REAR SEAT	72.7	-26.1	9.3				
	(LATERAL)	Δ V = 17.9 mph @ 28.50 msec			58.98	22.50	21.44	37.00
5	LEFT SILL AT FRONT SEAT	104.2	-26.3	9.0				
	(LATERAL)	Δ V = 16.7 mph @ 44.50 msec			62.33	7.88	10.03	62.50
6	LEFT FRONT DOOR CENTERLINE	102.6	-27.9	20.5				
	(LATERAL)	Δ V = 29.2 mph @ 14.38 msec			234.02	11.88	108.65	18.88
7	RIGHT REAR COMPARTMENT	32.2	20.6	17.8				
	(LONGITUDINAL)				5.29	42.00	8.82	22.63
8	MIDREAR OF LEFT FRONT DOOR	94.6	-28.1	23.1				
	(LATERAL)	Δ V = 25.9 mph @ 12.25 msec			γ335.43	68.75γ	95.13	19.38 γ
9	UPPER LEFT FRONT DOOR CENTERLINE	102.6	-28.3	28.0				
	(LATERAL)	Δ V = 20.8 mph @ 22.25 msec			161.67	12.63	47.93	20.75
10	MIDREAR OF LEFT REAR DOOR	63.5	-28.7	20.1				
	(LATERAL)	Δ V = 10.4 mph @ 12.13 msec			109.31	9.63	115.13	17.00
11	UPPER LEFT REAR DOOR CENTERLINE	63.7	-29.6	27.4				
	(LATERAL)	Δ V = 33.0 mph @ 14.25 msec			242.88	14.00	141.41	20.13

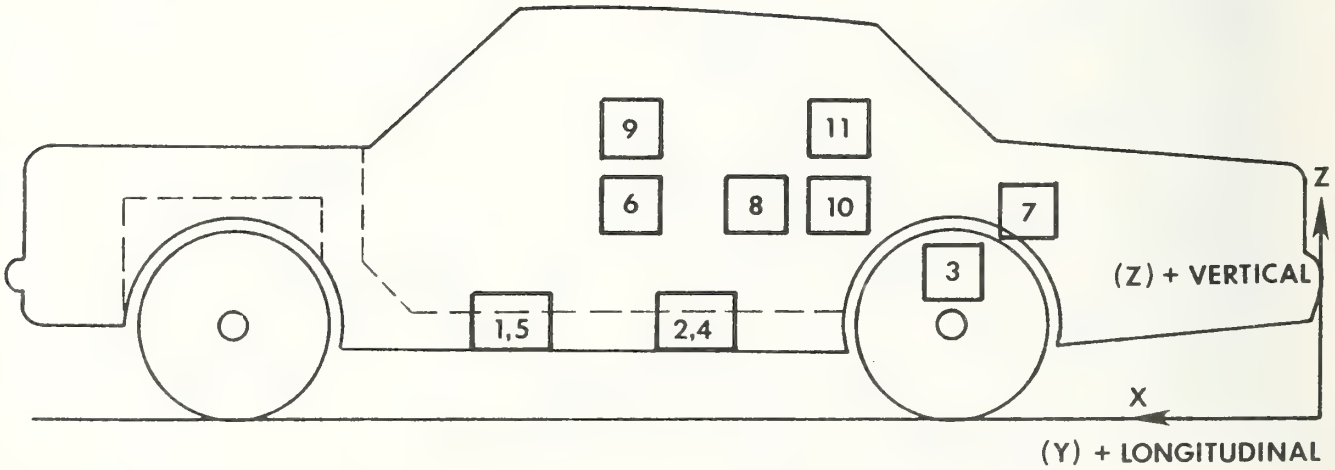
* Reference: X - Rear Bumper (+ Forward), Y - Vehicle Centerline (+ To Right), Z - Ground Level (+ Up)

All measurements of accelerometer locations in inches.

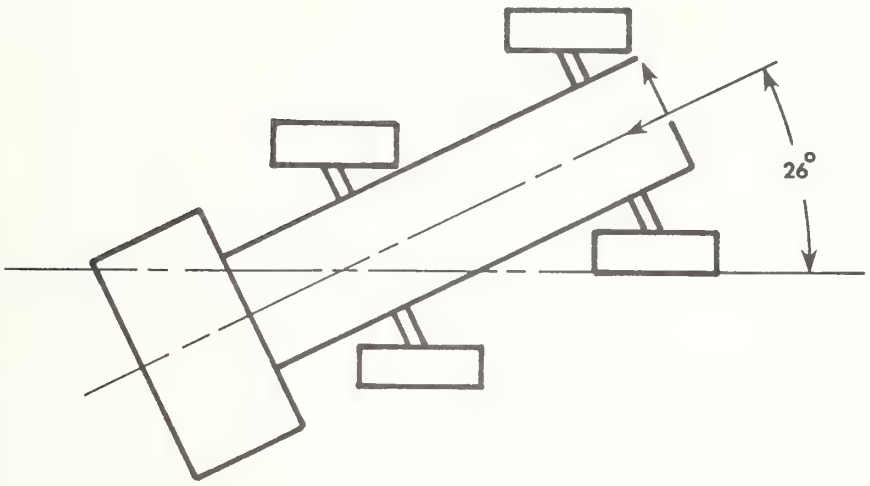
γ See TEST ANOMALIES

VEHICLE ACCELEROMETER LOCATIONS





MOVING BARRIER ACCELEROMETER LOCATIONS AND DATA SUMMARY



NO.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION MAX (g)	POSITIVE DIRECTION TIME (msec)	NEGATIVE DIRECTION MAX (g)	NEGATIVE DIRECTION TIME (msec)
1	CENTER OF GRAVITY	74.5	0.0	11.5				
	(LONGITUDINAL)	ΔV = -17.1 mph @ 120.00 msec			1.58	175.50	17.16	38.75
	(LATERAL)	ΔV = -4.8 mph @ 120.00 msec			0.97	168.75	8.27	28.25
	(VERTICAL)				15.56	133.13	14.21	144.38
	(RESULTANT)					17.72 @ 38.88		
2	FRONT FRAME MEMBER	130.3	0.0	11.3				
	(LONGITUDINAL)	ΔV = -18.6 mph @ 120.00 msec			1.77	148.63	16.83	38.50
3	REAR FRAME MEMBER	23.3	0.0	11.5				
	(LONGITUDINAL)	ΔV = -16.1 mph @ 120.00 msec			1.86	152.88	16.63	38.00

* Reference: X - Rear Most Point of Frame (+ To Forward), Y - Barrier Centerline (+ To Right), Z - Ground Level (+ To Up)

All measurements of accelerometer locations in inches.

HIGH SPEED CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	Overhead	Photosonics 1B	8	770	Vehicle Dynamics
2	Overhead	Photosonics 1B	25	775	Close-up of impact point
3	Onboard MDB	Photosonics 1B	25	---*	Close-up of impact point
4	Onboard MDB	Stalex	13	166	Driver kinematics
5	Ground level - right	Photosonics 1B	25	737	Overall view
6	Ground level - left	Photosonics 1B	17	800	Overall view
7	Onboard vehicle	Photosonics 1B	8	807	Driver kinematics - front view
8	Onboard vehicle	Photosonics 1B	8	805	Driver kinematics
9	Onboard vehicle	Photosonics 1B	8	812	Passenger kinematics

NOTE: CAMERAS ARE NUMBERED ACCORDING TO SPLICING SEQUENCE OF FILM. (24 fps) REAL TIME MOVIE FILM COVERAGE OF PRE-CRASH, POST-CRASH AND CRASH EVENT SPLICED AT START AND END OF FILM.

*SEE TEST ANOMALIES

LOCATIONS OF OFFBOARD HIGH SPEED CAMERAS

CAMERA NO.	X	Y	Z
1	0	0	25'
2	0	0	25'
5	24'10"	58'8"	45"
6	-20'11"	-13'3"	45"

Origin of Coordinate System is Point of Impact

+X = Forward with Respect to Striking Vehicle's Velocity Vector
+Y = Rightward with Respect to Striking Vehicle's Velocity Vector
+Z = Upward with Respect to Striking Vehicle's Velocity Vector

NON-GOVERNMENT FURNISHED TRANSDUCER INFORMATION

PARAMETER BEING MEASURED	TYPE OF TRANSDUCER	MODEL NUMBER	SERIAL NUMBER	MFGR.	DATE OF LAST CALIBRATION	SENSITIVITY	DESIRED FULL SCALE (ENGR. UNITS)
BCGXG	Accel	4-202-0001	18845	Bell Howell	12/7/83	.237 MV/G	50 G
BCGYG	Accel	4-202-0001	18858	Bell Howell	12/7/83	.240 MV/G	50 G
BCGZG	Accel	4-202-0001	18857	Bell Howell	12/7/83	.240 MV/G	50 G
BFCXG	Accel	4-202-0001	18240	Bell Howell	12/7/83	.240 MV/G	50 G
BRCXG	Accel	4-202-0001	19022	Bell Howell	12/7/83	.222 MV/G	50 G

All dummy and struck vehicle accelerometers were Government Furnished Equipment and were Endevco 2264 Accelerometers.

APPENDIX A

PHOTOGRAPHS

Figure A-1. PRE-TEST OVERALL - VIEW 1

Figure A-2. PRE-TEST OVERALL - VIEW 2

Figure A-3. PRE-TEST OVERALL - VIEW 3

Figure A-4. PRE-TEST OVERALL - VIEW 4

Figure A-5. PRE-TEST CLOSEUP - VIEW 1

Figure A-6. PRE-TEST CLOSEUP - VIEW 2

Figure A-7. PRE-TEST DRIVER DUMMY - VIEW 1

Figure A-8. PRE-TEST DRIVER DUMMY - VIEW 2

Figure A-9. PRE-TEST PASSENGER DUMMY - VIEW 1

Figure A-10. PRE-TEST PASSENGER DUMMY - VIEW 2

Figure A-11. CRASH EVENT PHOTOGRAPH

Figure A-12. POST-TEST OVERALL - VIEW 1

Figure A-13. POST-TEST OVERALL - VIEW 2

Figure A-14. POST-TEST OVERALL - VIEW 3

Figure A-15. POST-TEST OVERALL - VIEW 4

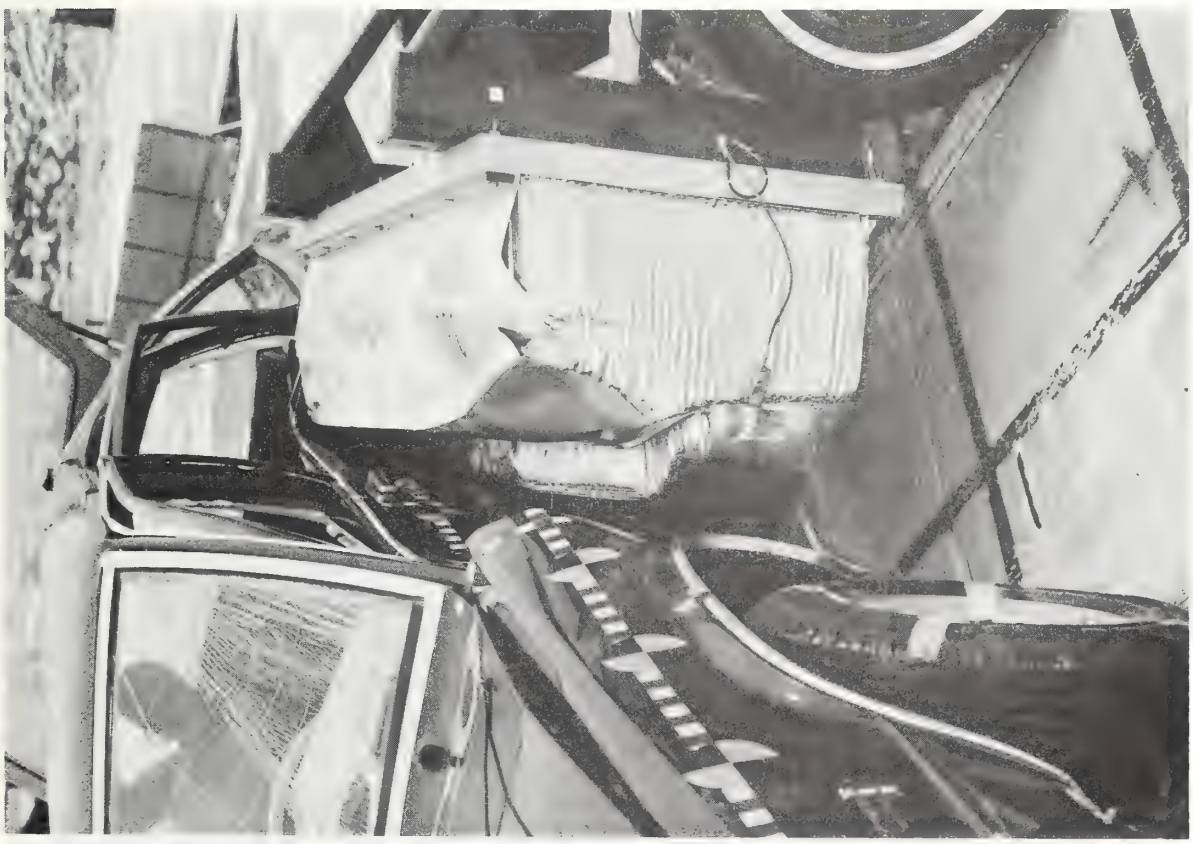


Figure A-16. POST-TEST CLOSEUP - VIEW 1

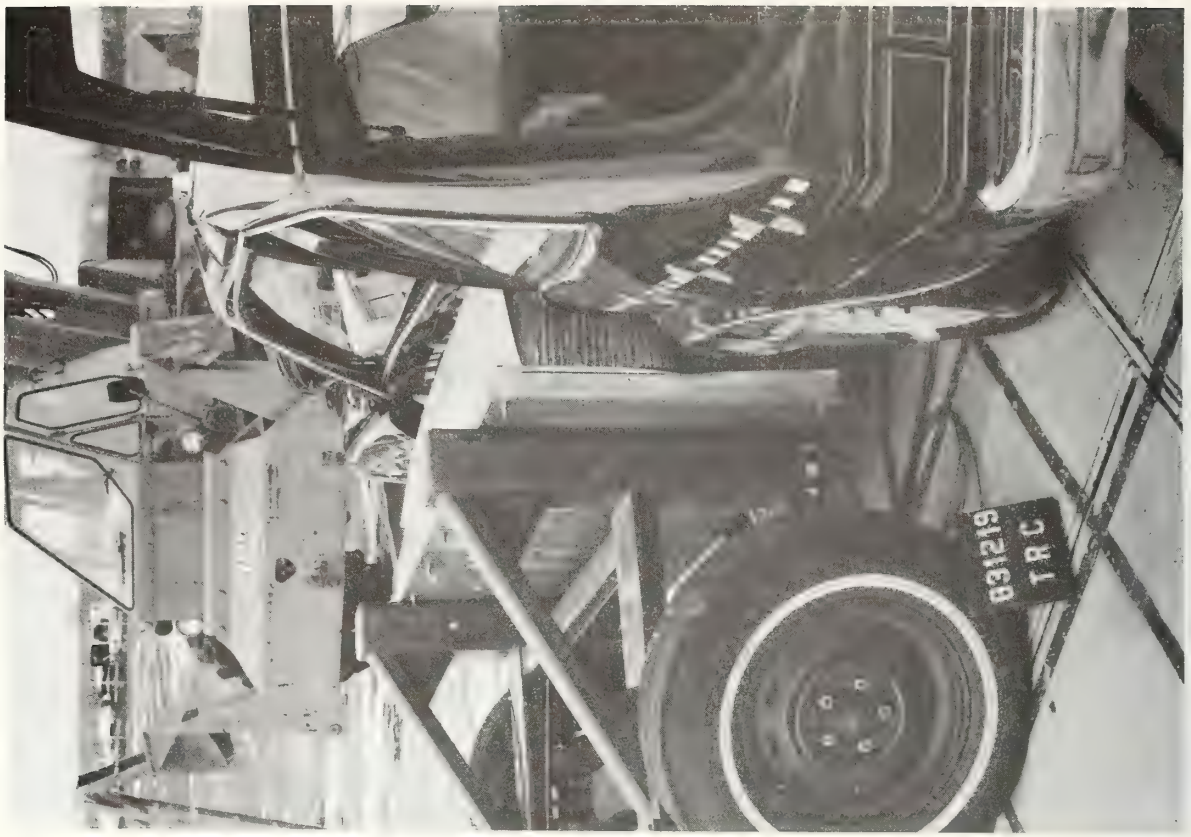


Figure A-17. POST-TEST CLOSEUP - VIEW 2

Figure A-18. POST-TEST DRIVER DUMMY - VIEW 1

Figure A-19. POST-TEST DRIVER DUMMY - VIEW 2

Figure A-20. POST-TEST PASSENGER DUMMY - VIEW 1

Figure A-21. POST-TEST PASSENGER DUMMY - VIEW 2

Figure A-22. POST-TEST VEHICLE DAMAGE - VIEW 1

Figure A-23. POST-TEST VEHICLE DAMAGE - VIEW 2

Figure A-24. PRE-TEST MDB FACE - VIEW 1

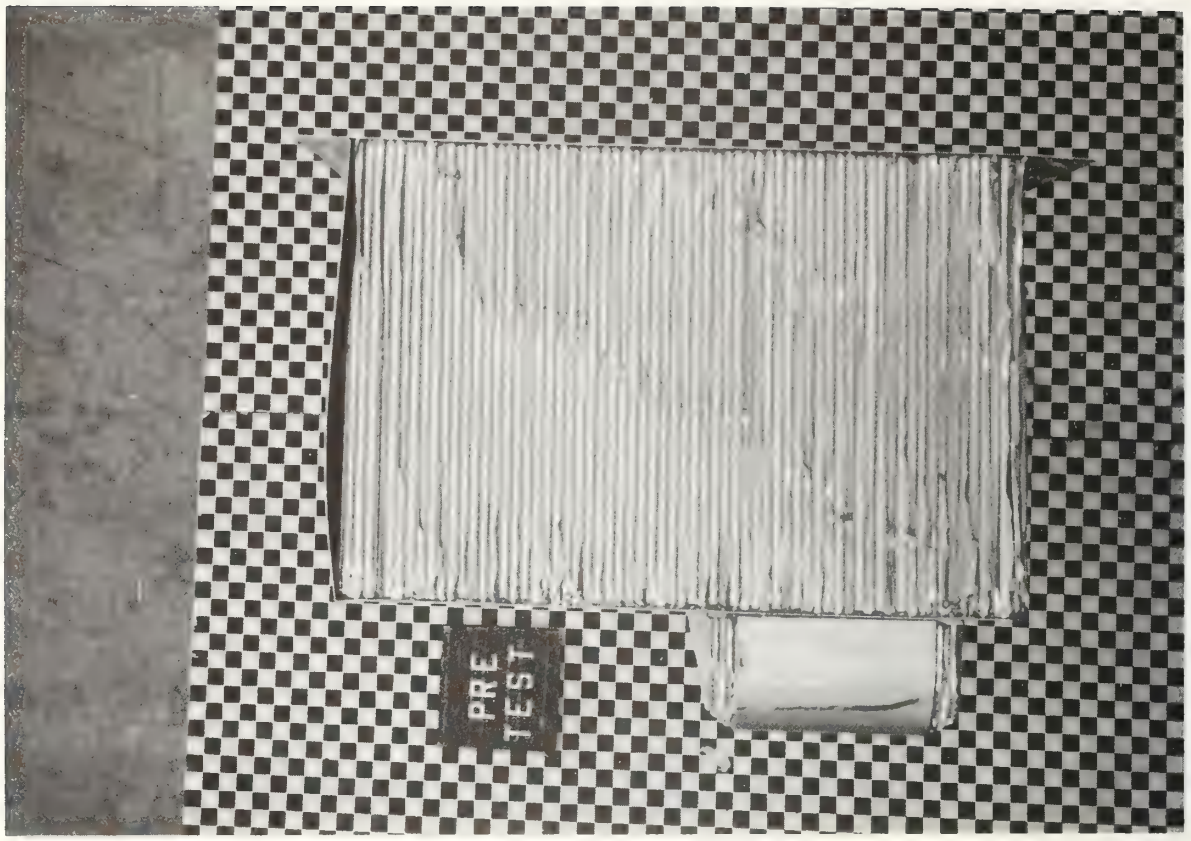


Figure A-25. PRE-TEST MDB FACE - VIEW 2

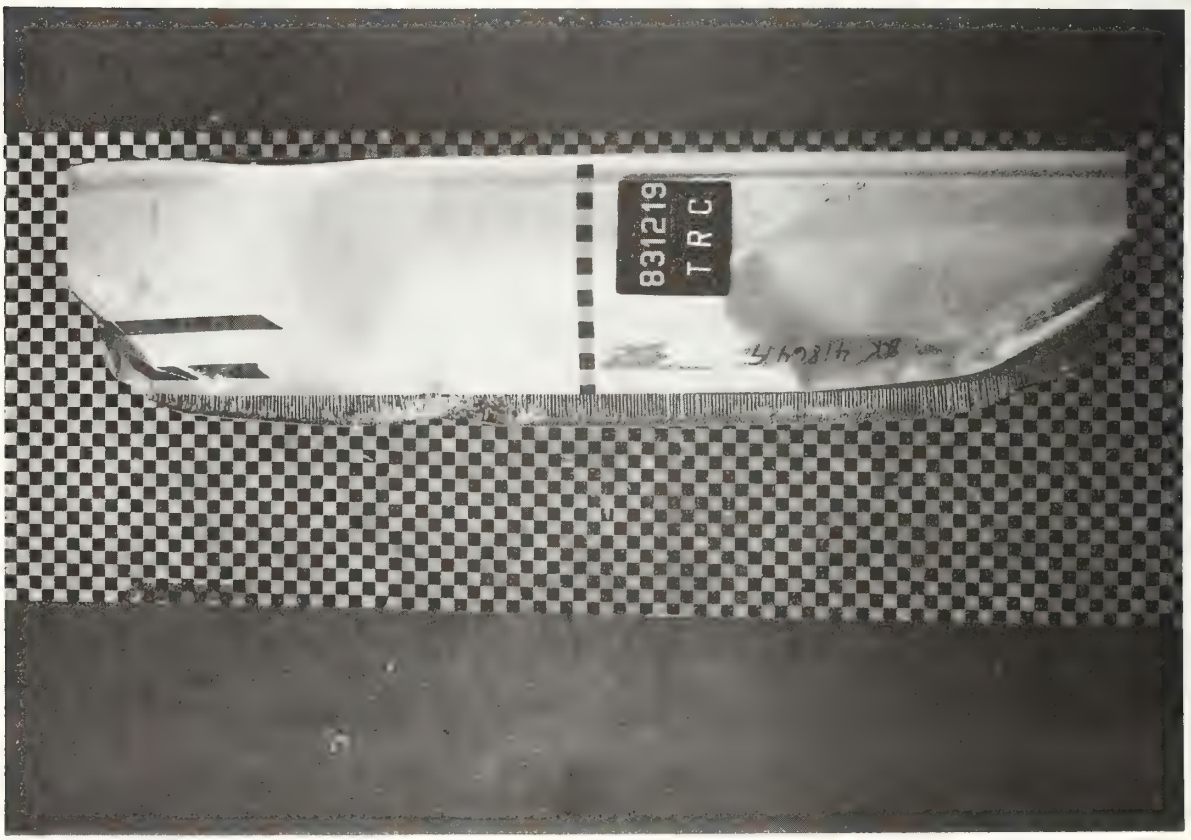


Figure A-26. POST-TEST MDB FACE - VIEW 1

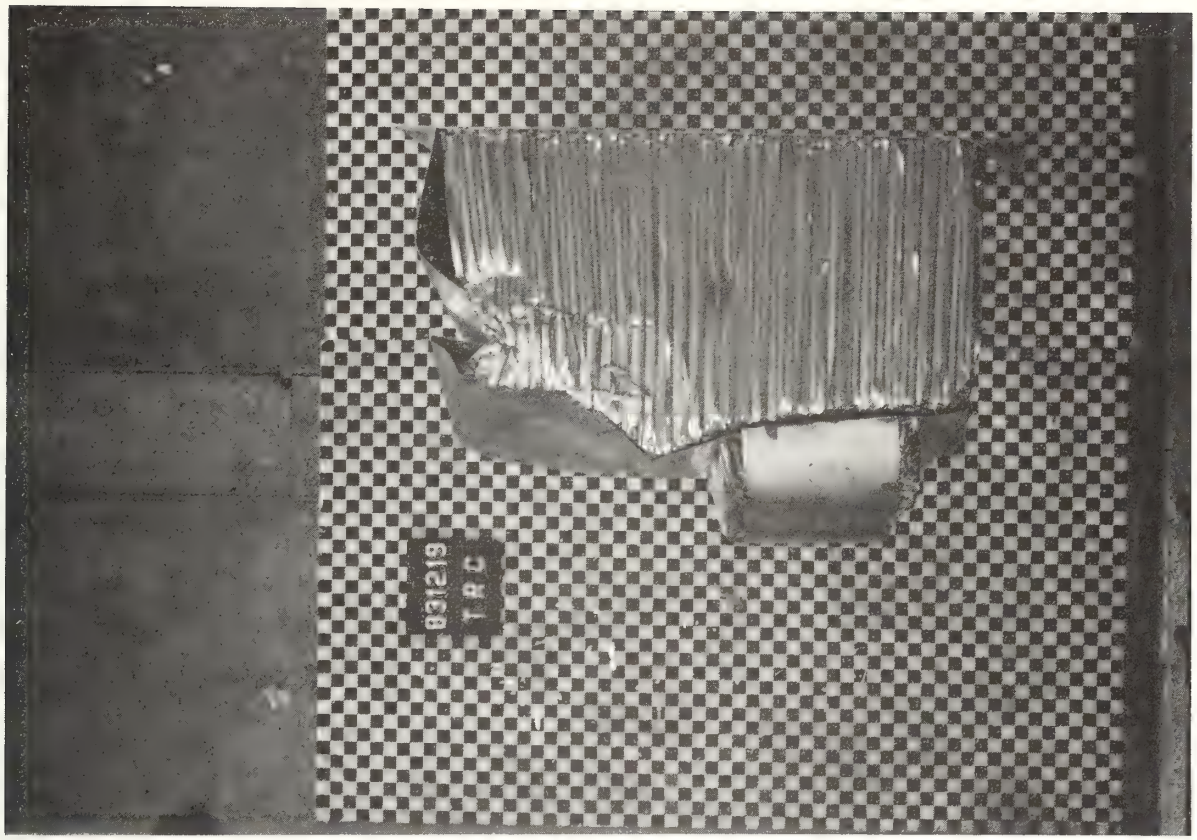
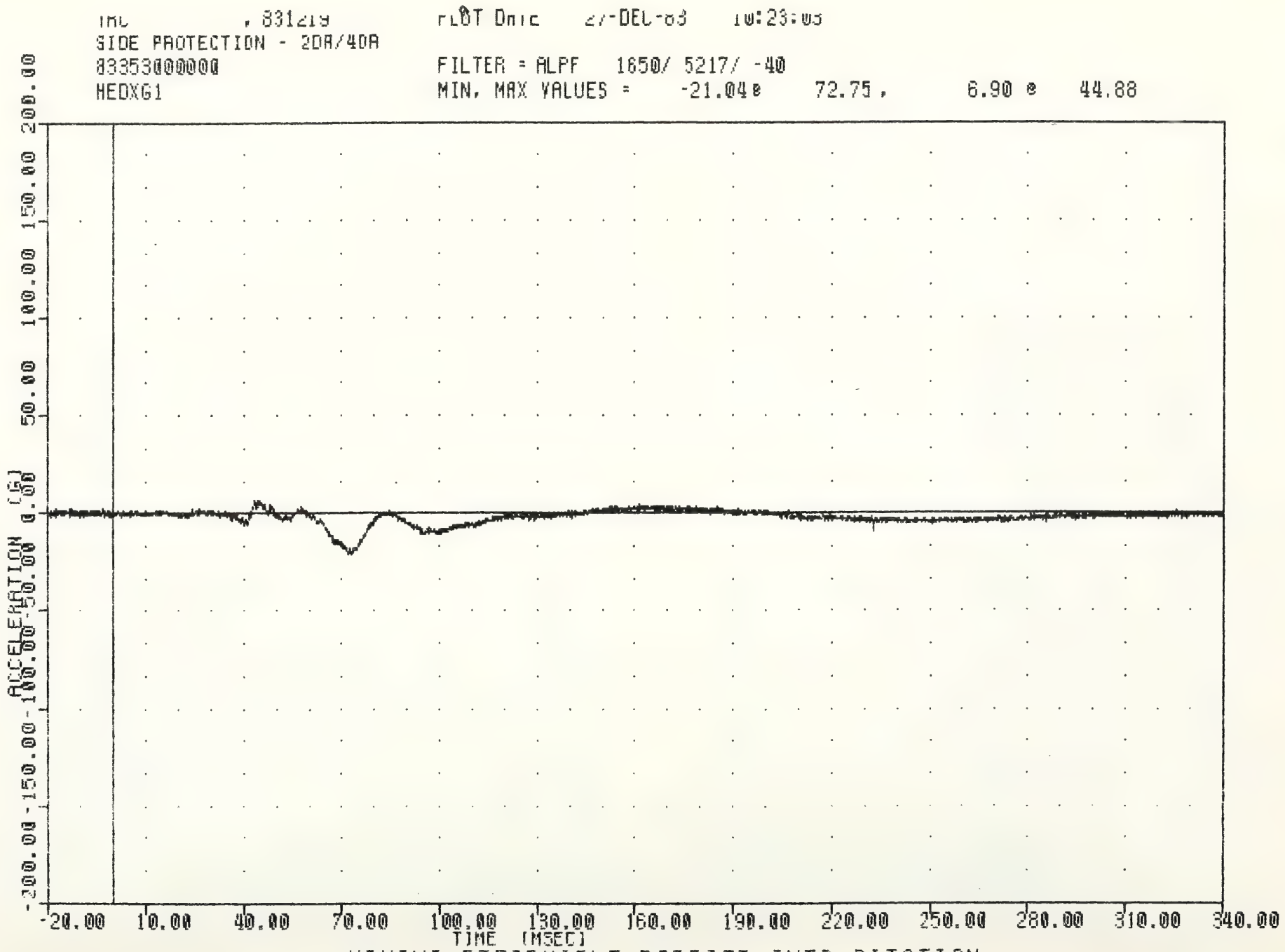


Figure A-27. POST-TEST MDB FACE - VIEW 2

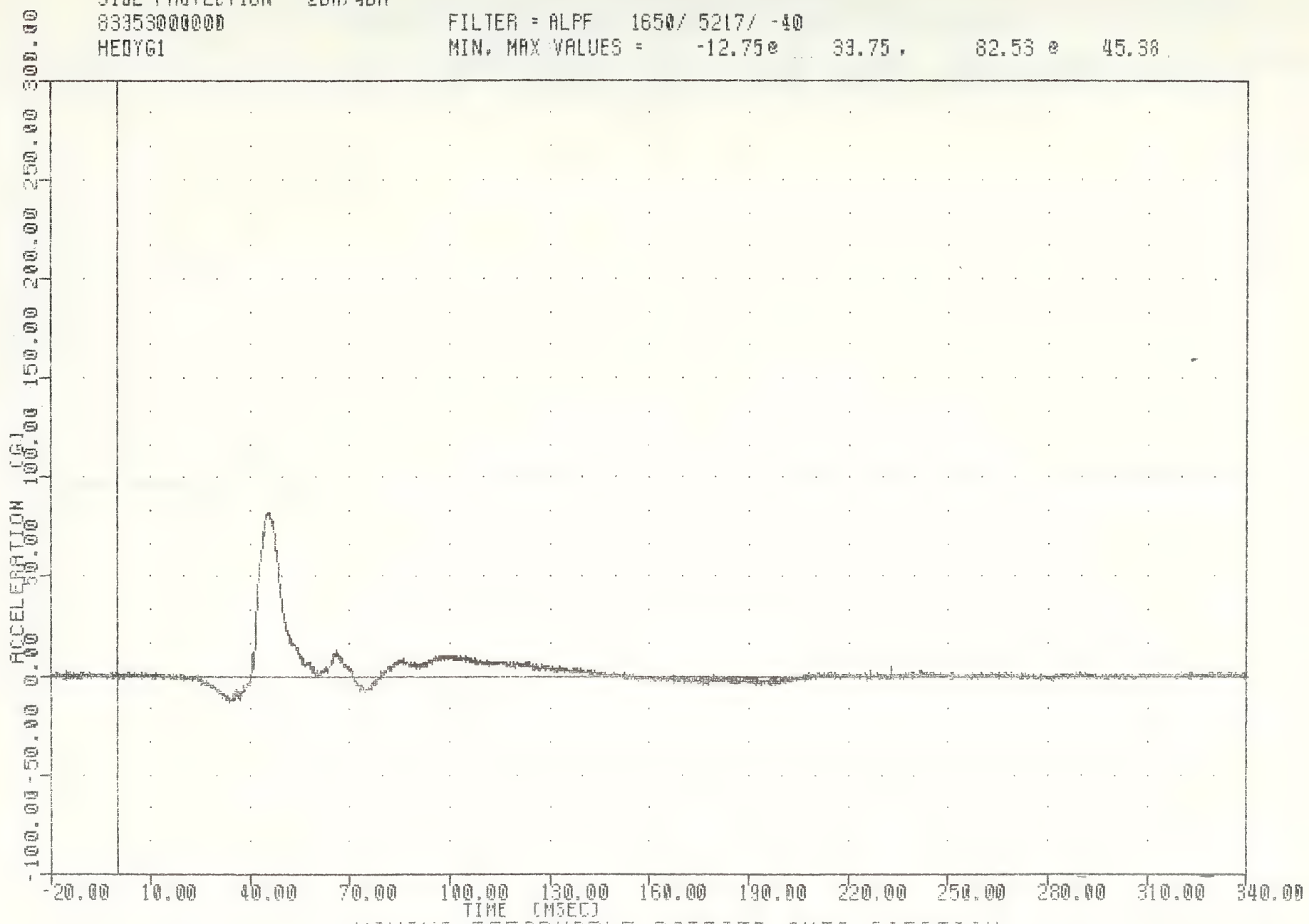
APPENDIX B

DATA PLOT PRESENTATION

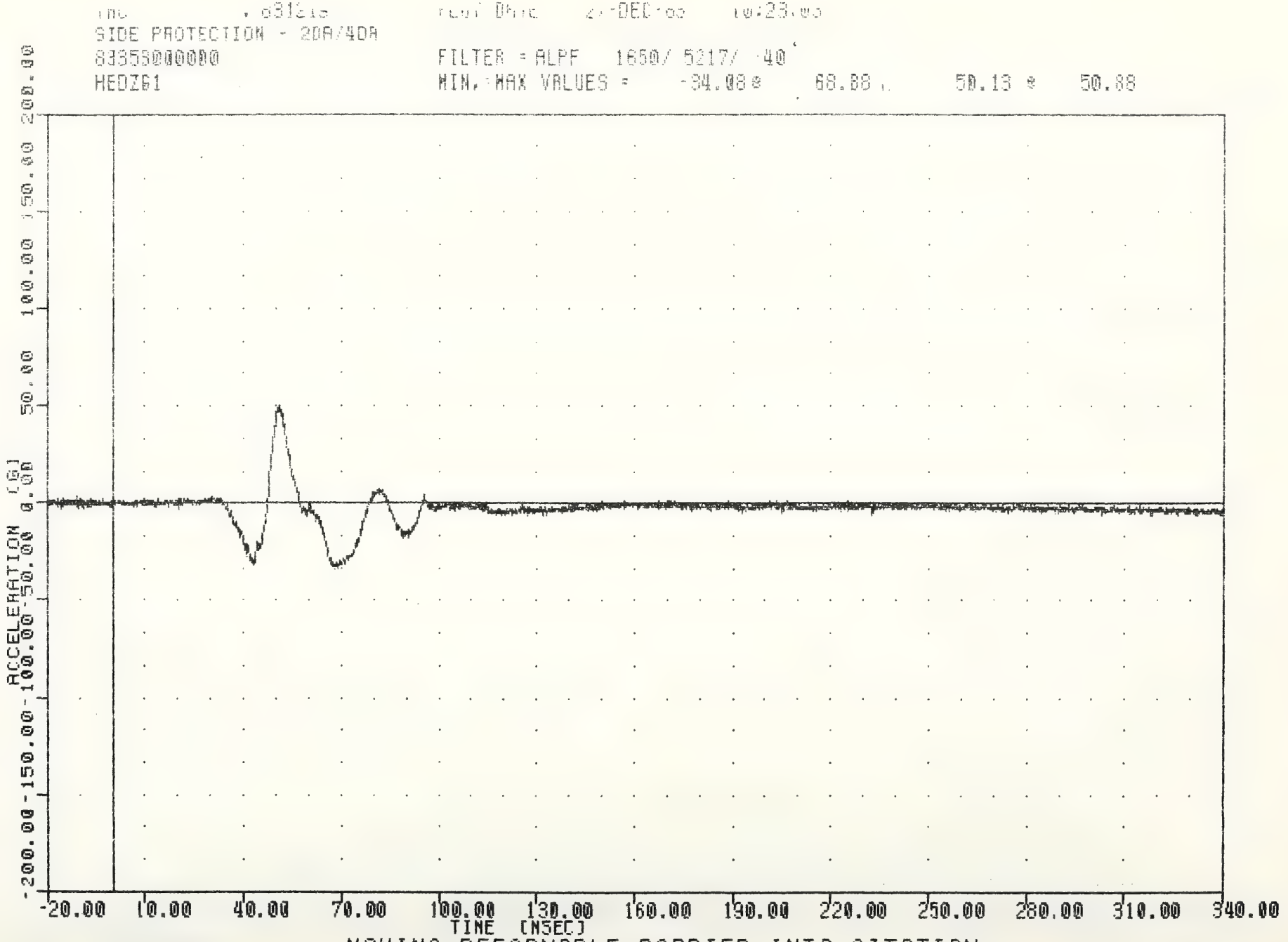
Data plots generated from the crash test data are presented on the following pages. All data are recorded on magnetic tape for inclusion in the NHTSA crash test data base system. All data were filtered according to SAE J211, except that dummy thorax data were filtered using the HSRI filter.



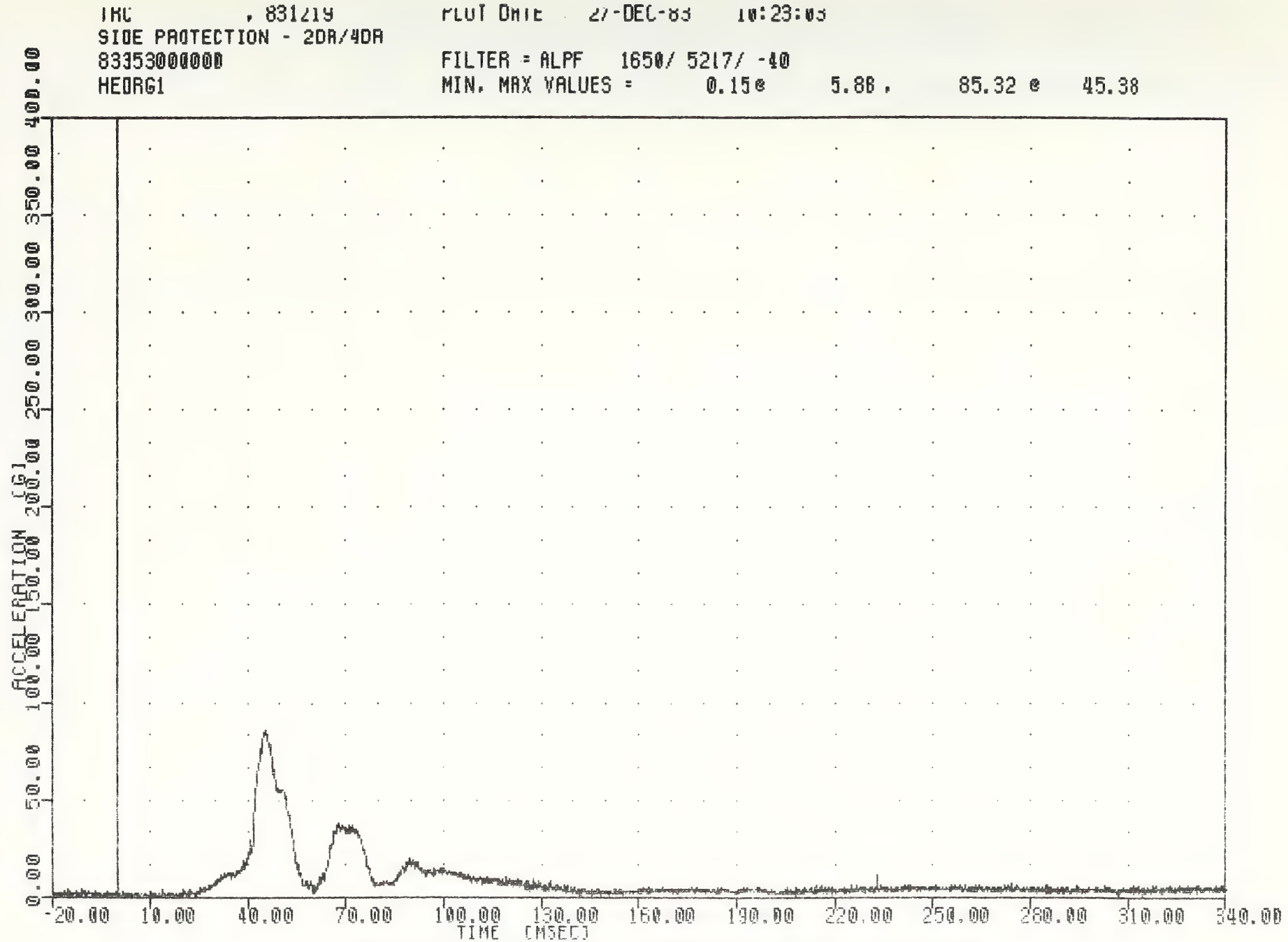
MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER HEAD ACCELERATION X AXIS



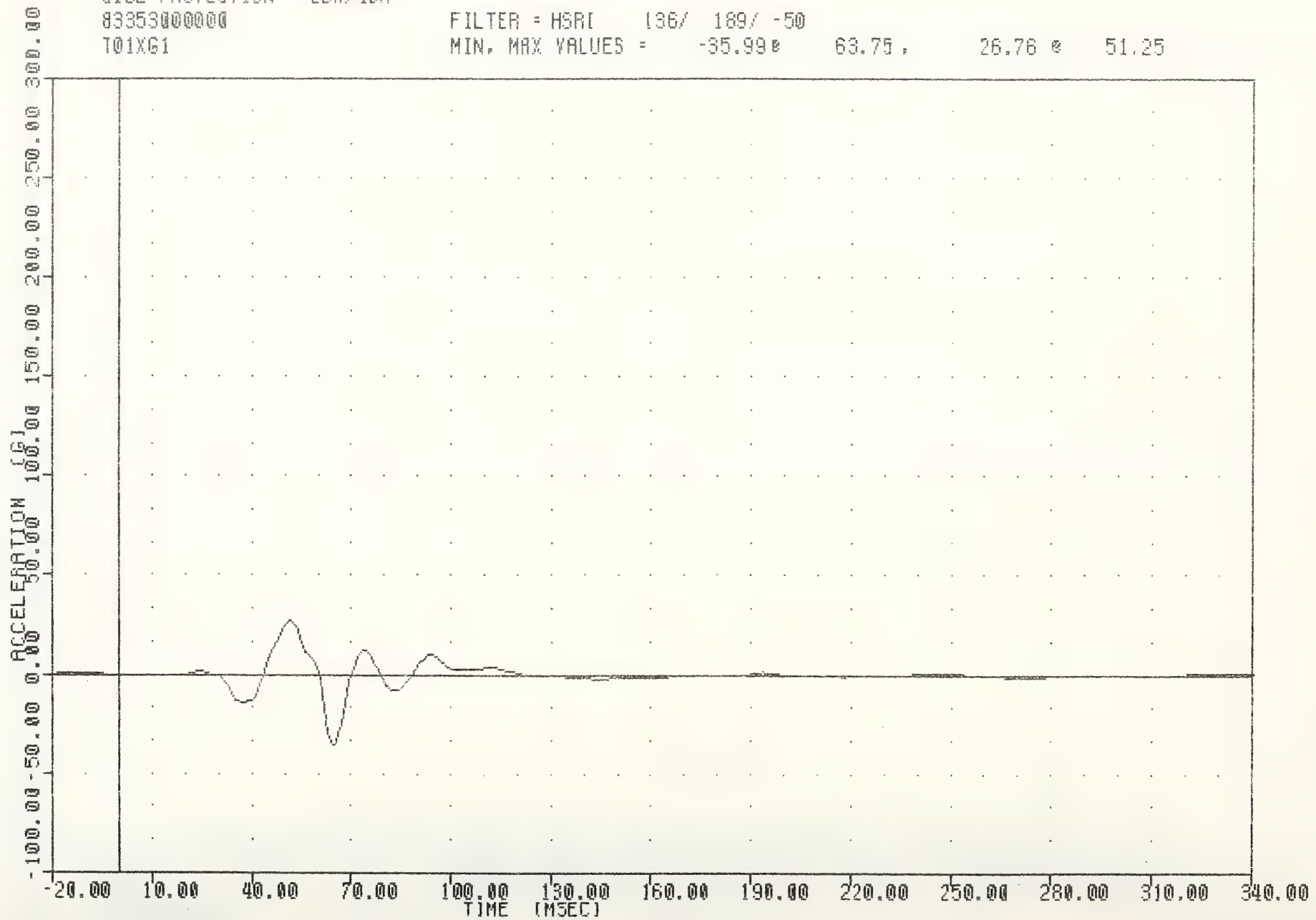
MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER HEAD ACCELERATION Y AXIS



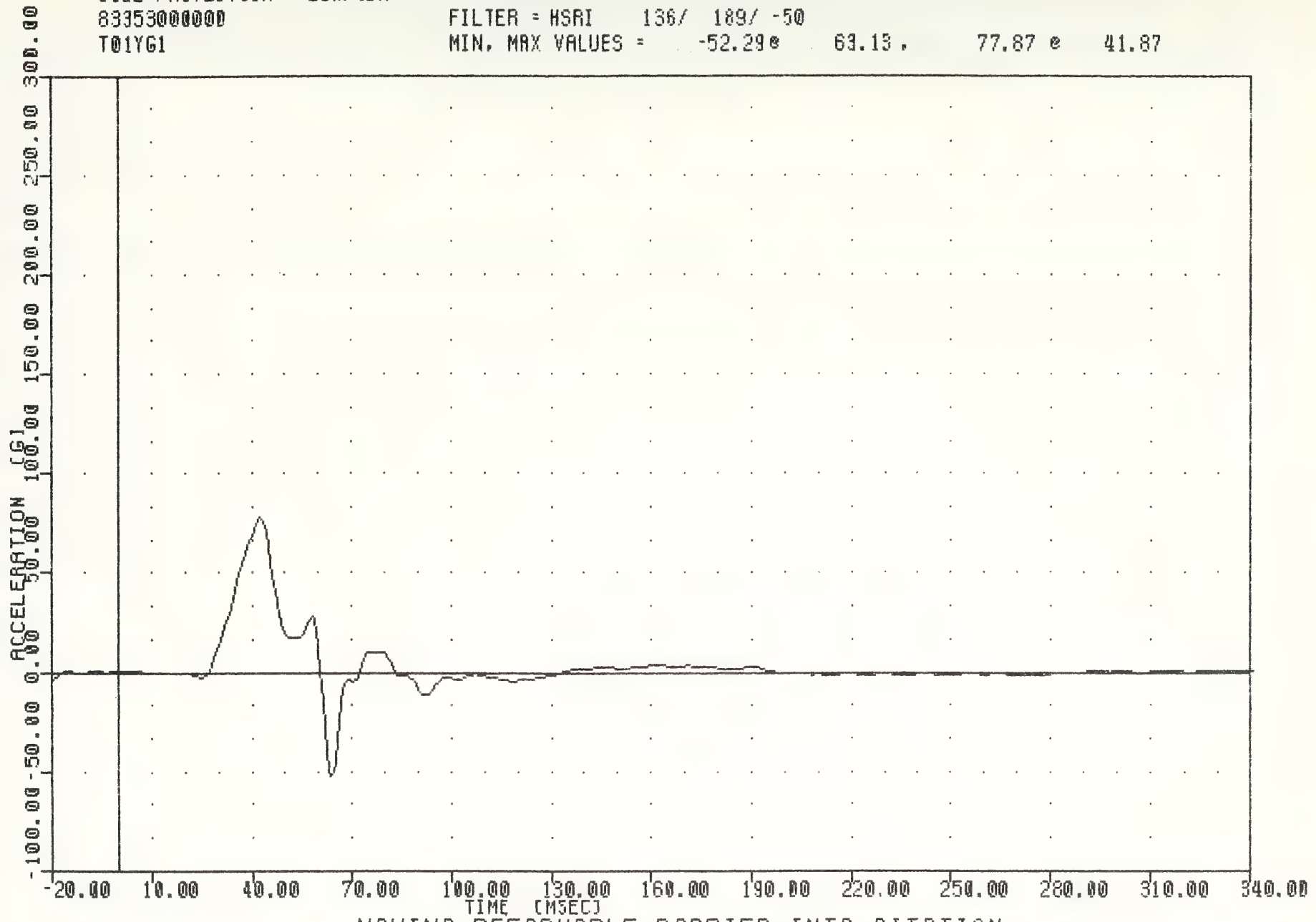
MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER HEAD ACCELERATION Z AXIS



MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER HEAD RESULTANT

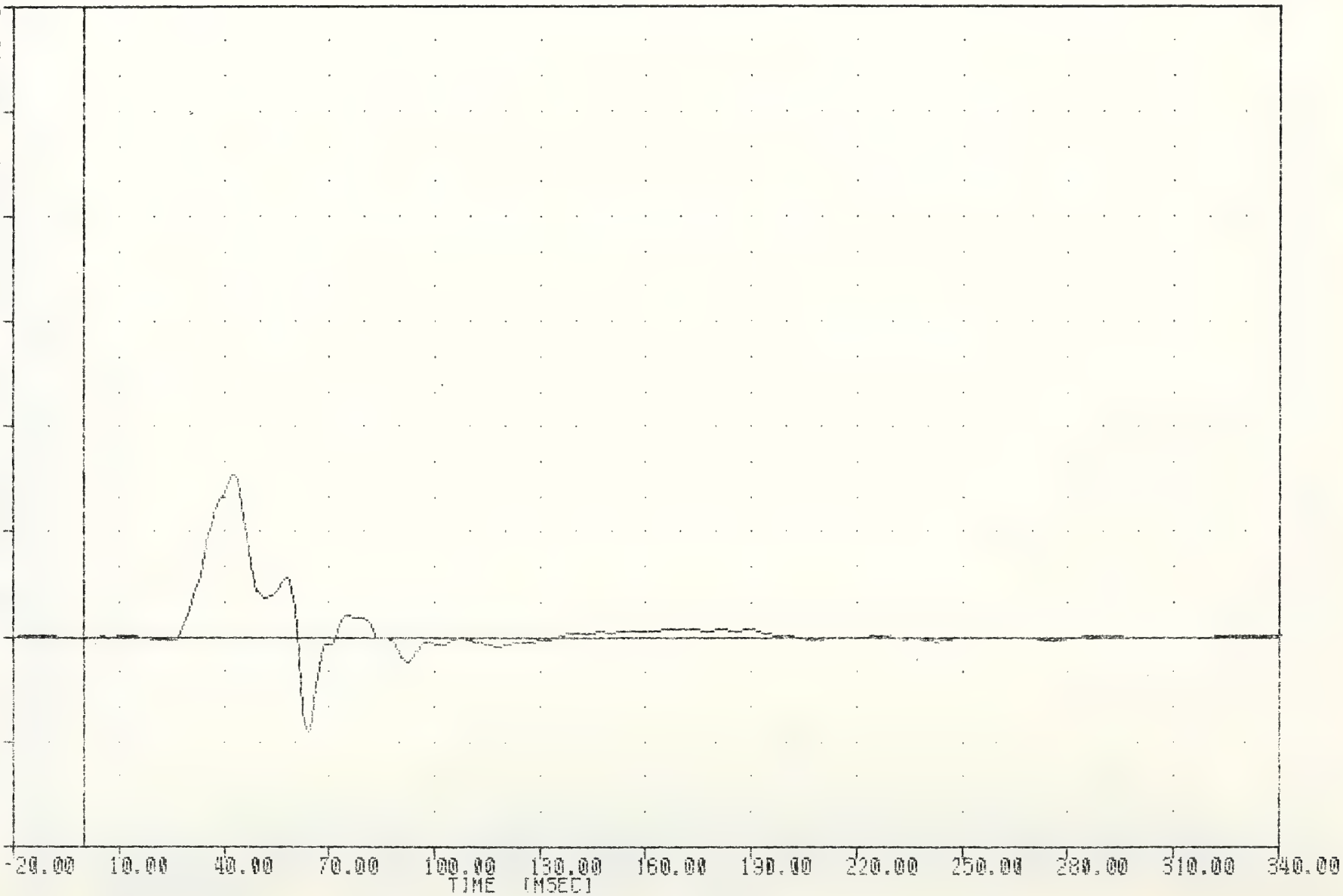


MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER UPPER SPINE ACCELERATION X AXIS

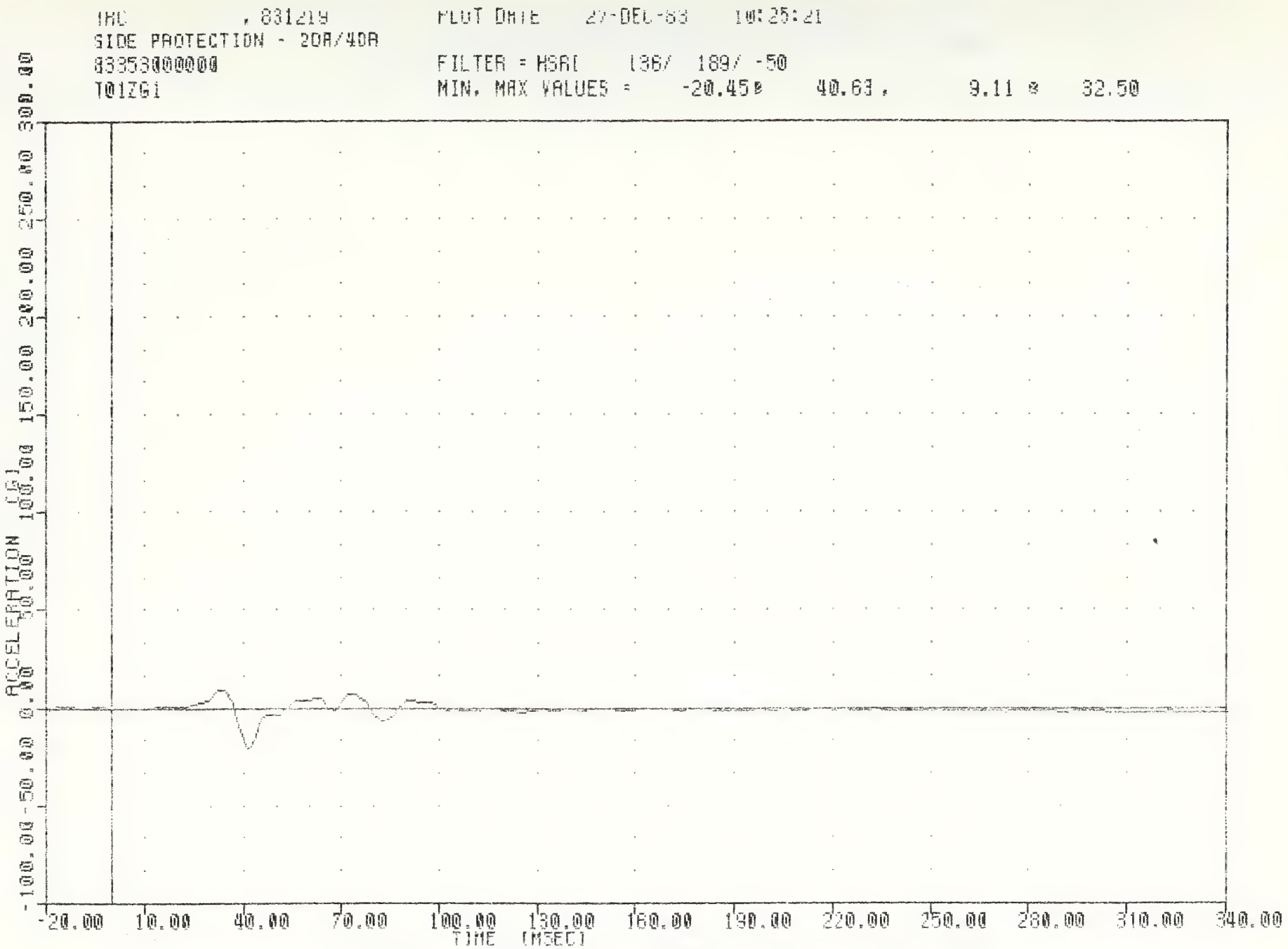


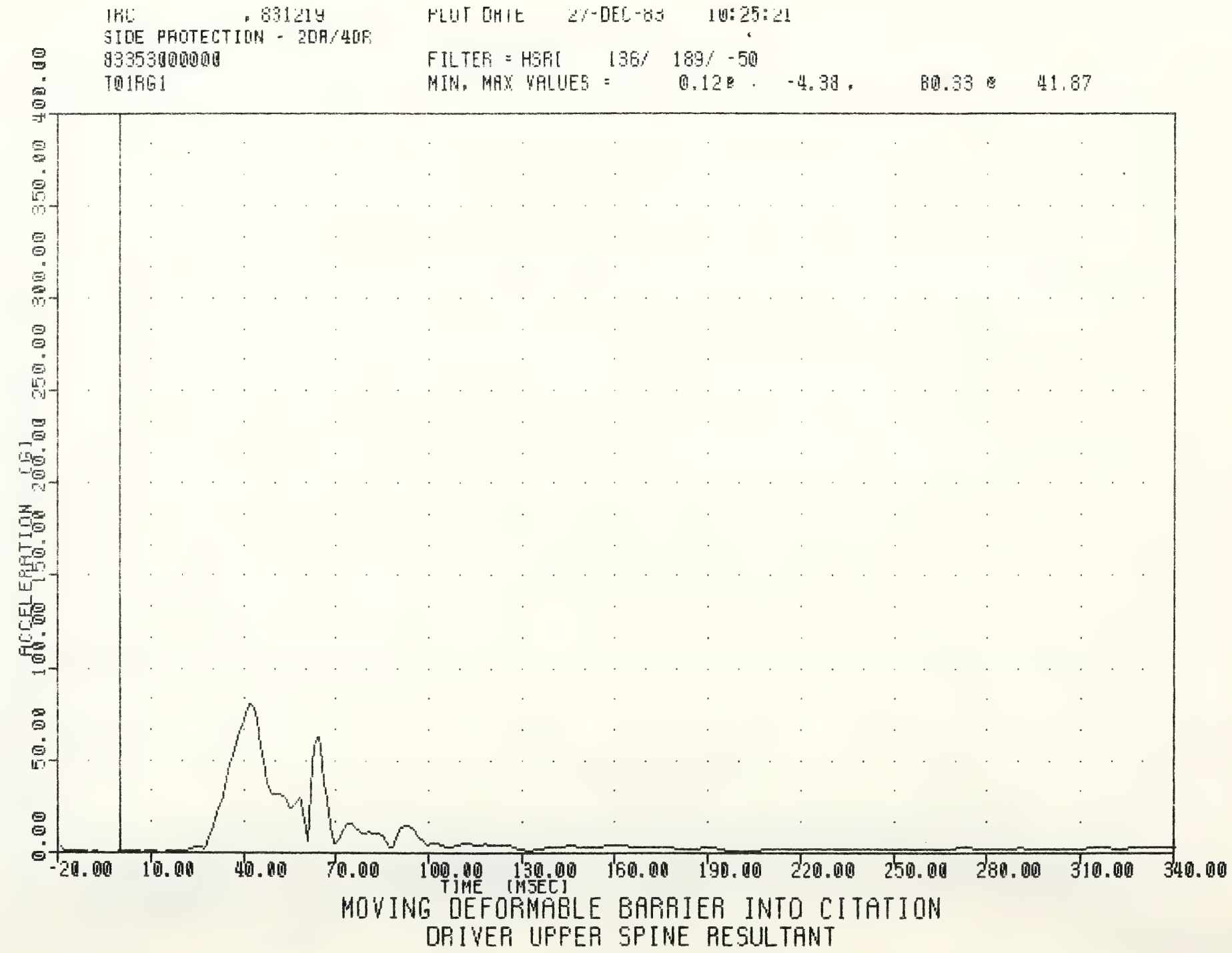
MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER UPPER SPINE ACCELERATION Y AXIS

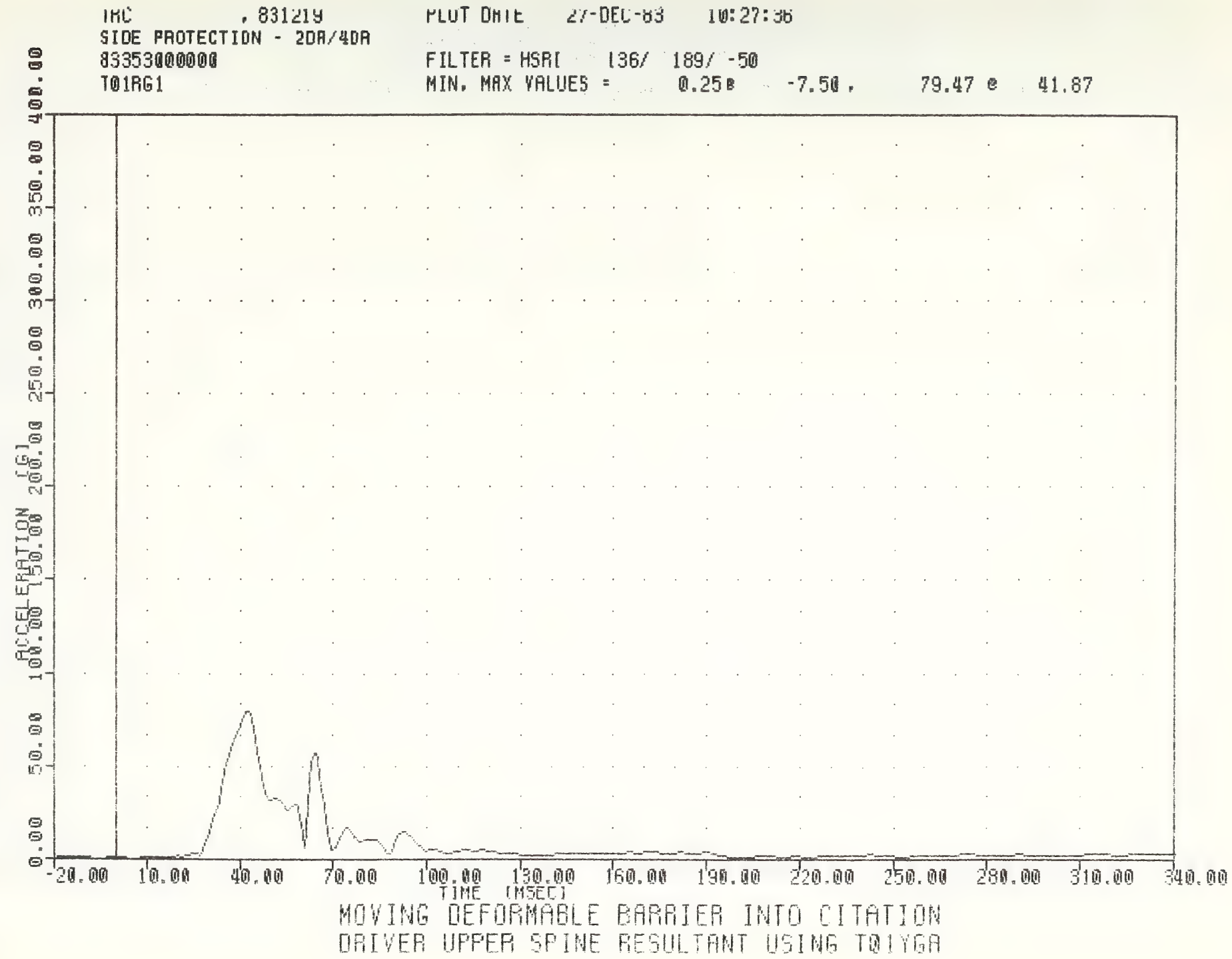
IRC , 831219 PLOT DATE 3-JAN-84 10:13:17
SIDE PROTECTION - 2DR/4DR
833530000000 FILTER = HSRI 136/ 189/ -50
T01YGR MIN, MAX VALUES = -45.46 @ 63.13 , 76.98 @ 41.87

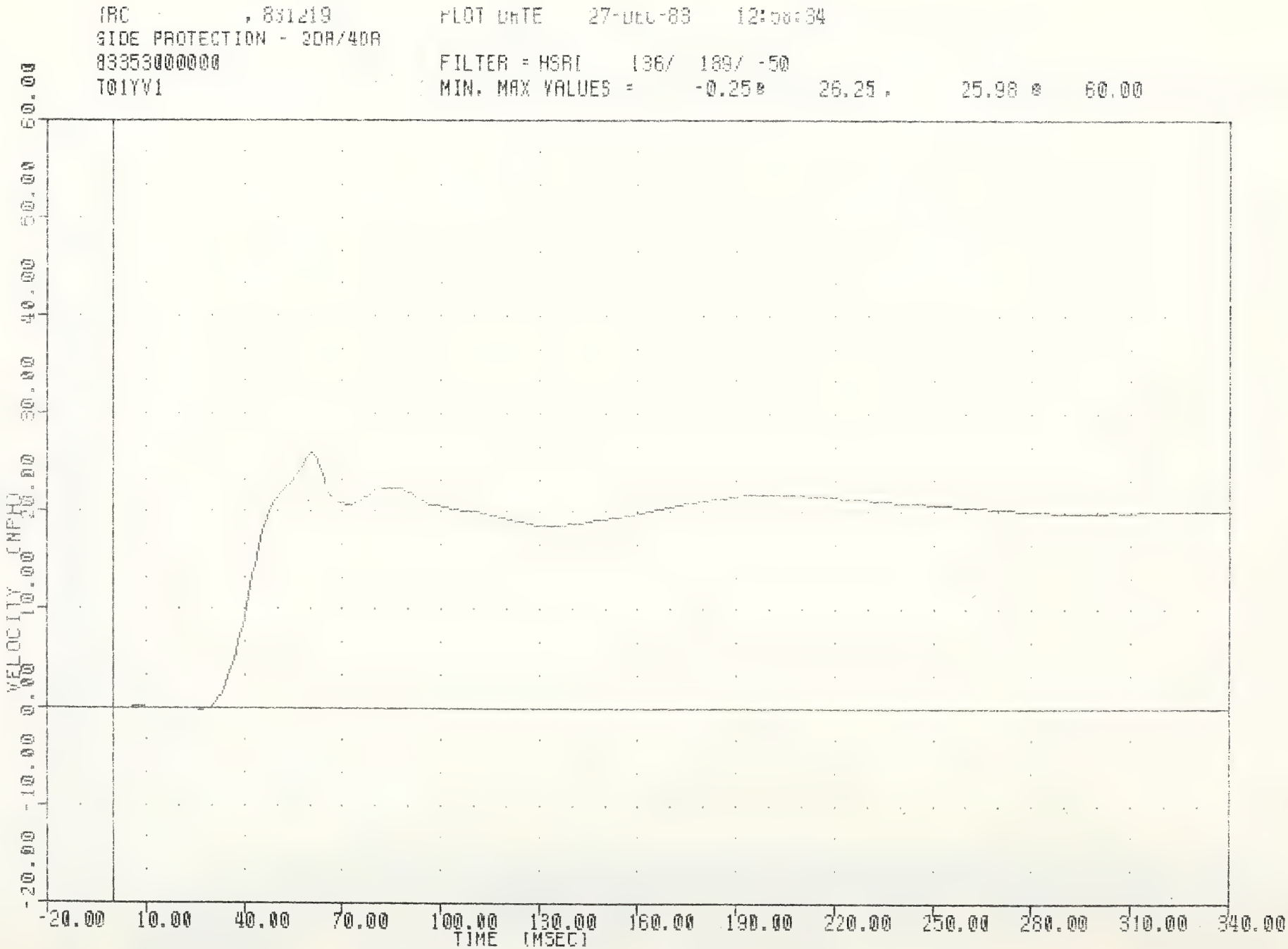


MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER UPPER SPINE ACCELERATION *2 Y AXIS


IRC , 831219
SIDE PROTECTION - 20A/40A
83353@@@@@@
T@1ZG1
PLOT DATE 27-DEC-83 10:25:21
FILTER = HSRI 136/ 189/ -50
MIN, MAX VALUES = -20.45@ 40.63 , 9.11 @ 32.50
ACCELERATION (G)
-100.00 -50.00 0.00 50.00 100.00 150.00 200.00 250.00 300.00
-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER UPPER SPINE ACCELERATION Z AXIS

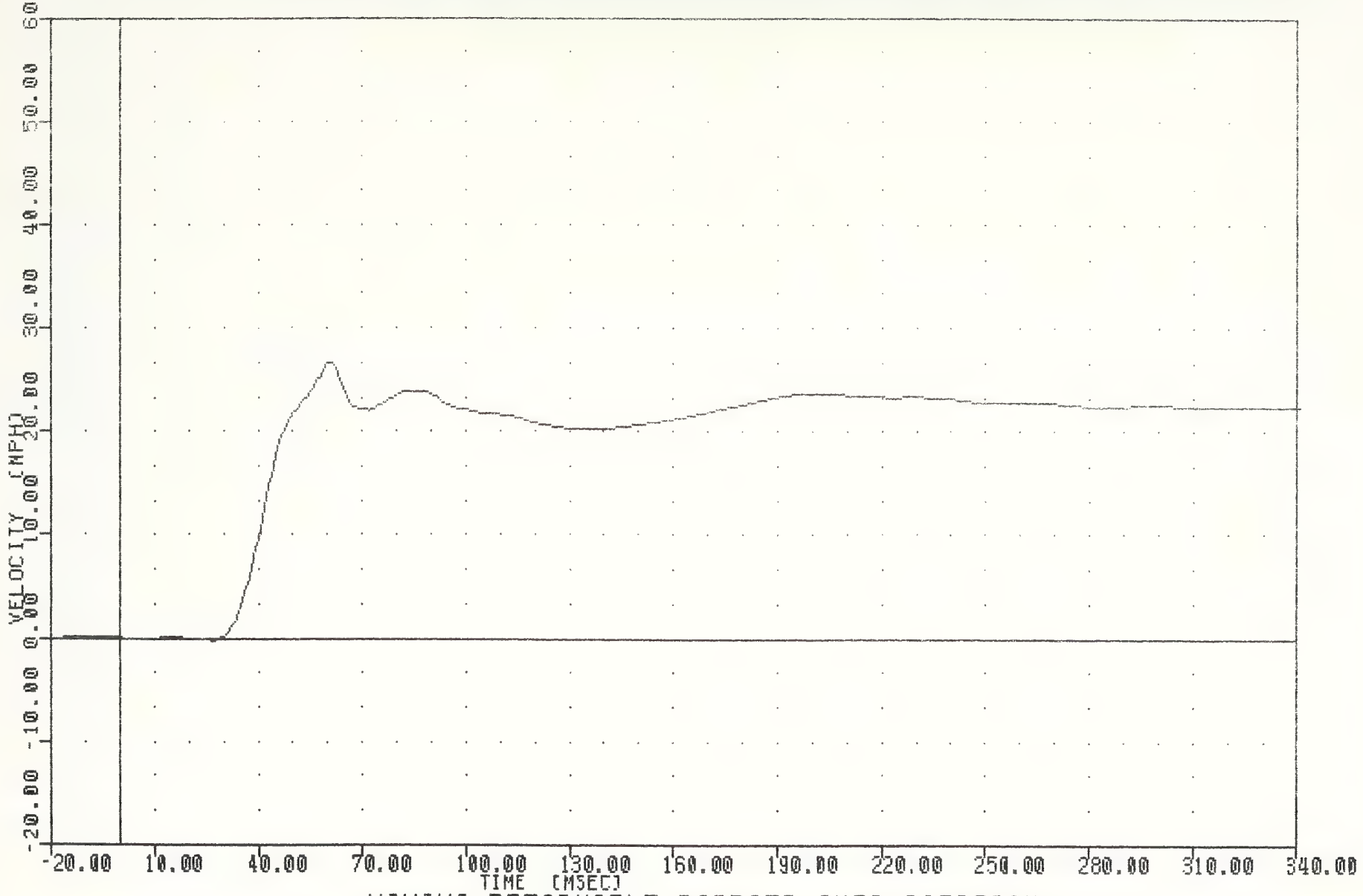

IRC , 831219
PLOT DATE 27-DEC-83 10:25:21
SIDE PROTECTION - 2DR/4DR
83353000000
FILTER = HSRI 136/ 189/ -50
T01RG1
MIN, MAX VALUES = 0.12@ , -4.38 , 80.33 @ 41.87
ACCELERATION (G)
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER UPPER SPINE RESULTANT


IRC , 831219
PLOT DATE 27-DEC-83 10:27:36
SIDE PROTECTION - 2DR/4DR
83353000000
FILTER = HSRI 136/ 189/ -50
T01RG1
MIN, MAX VALUES = 0.25 @ -7.50 , 79.47 @ 41.87
ACCELERATION (G)
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER UPPER SPINE RESULTANT USING T01YGA

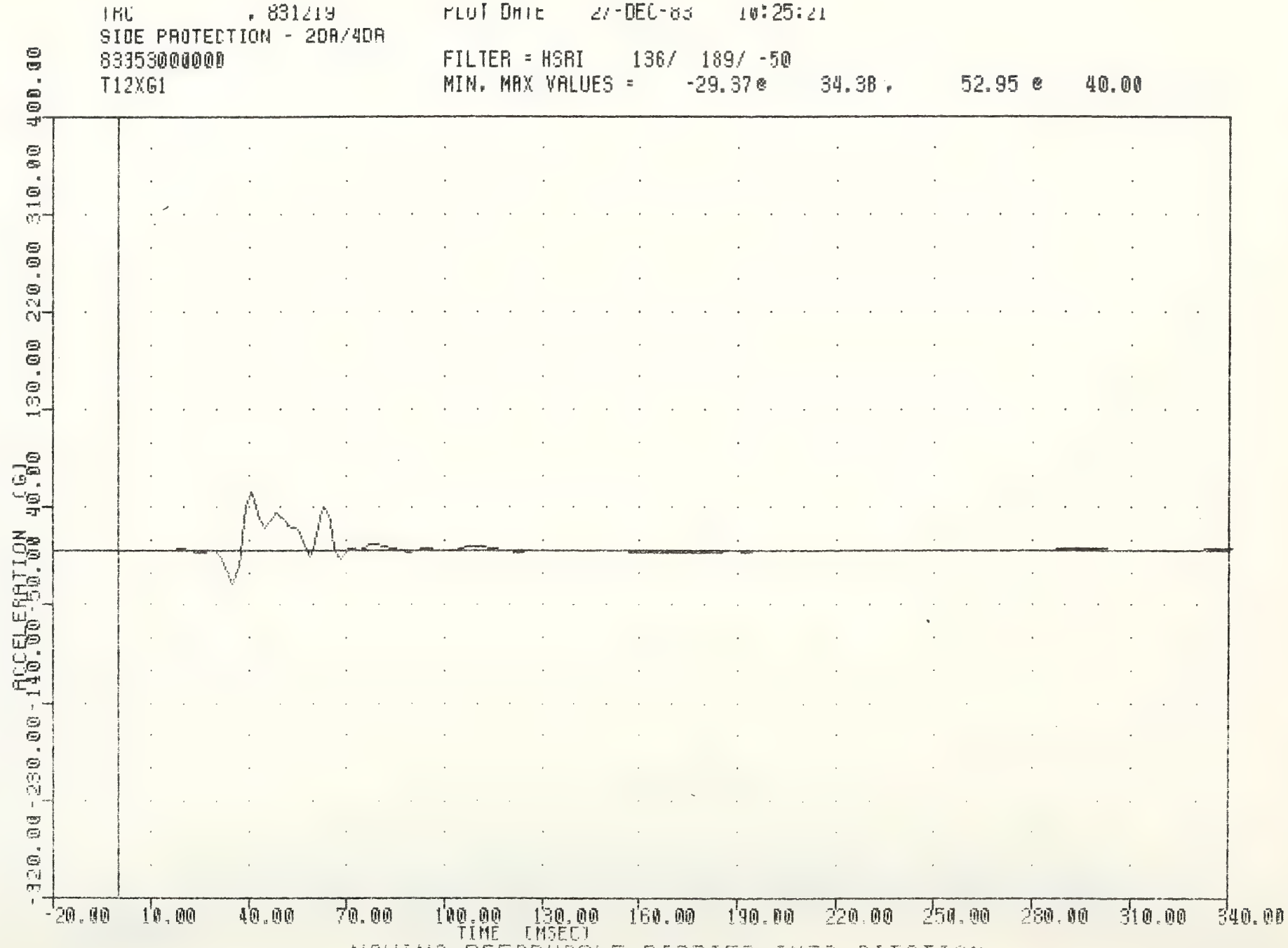


MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING T01YG1

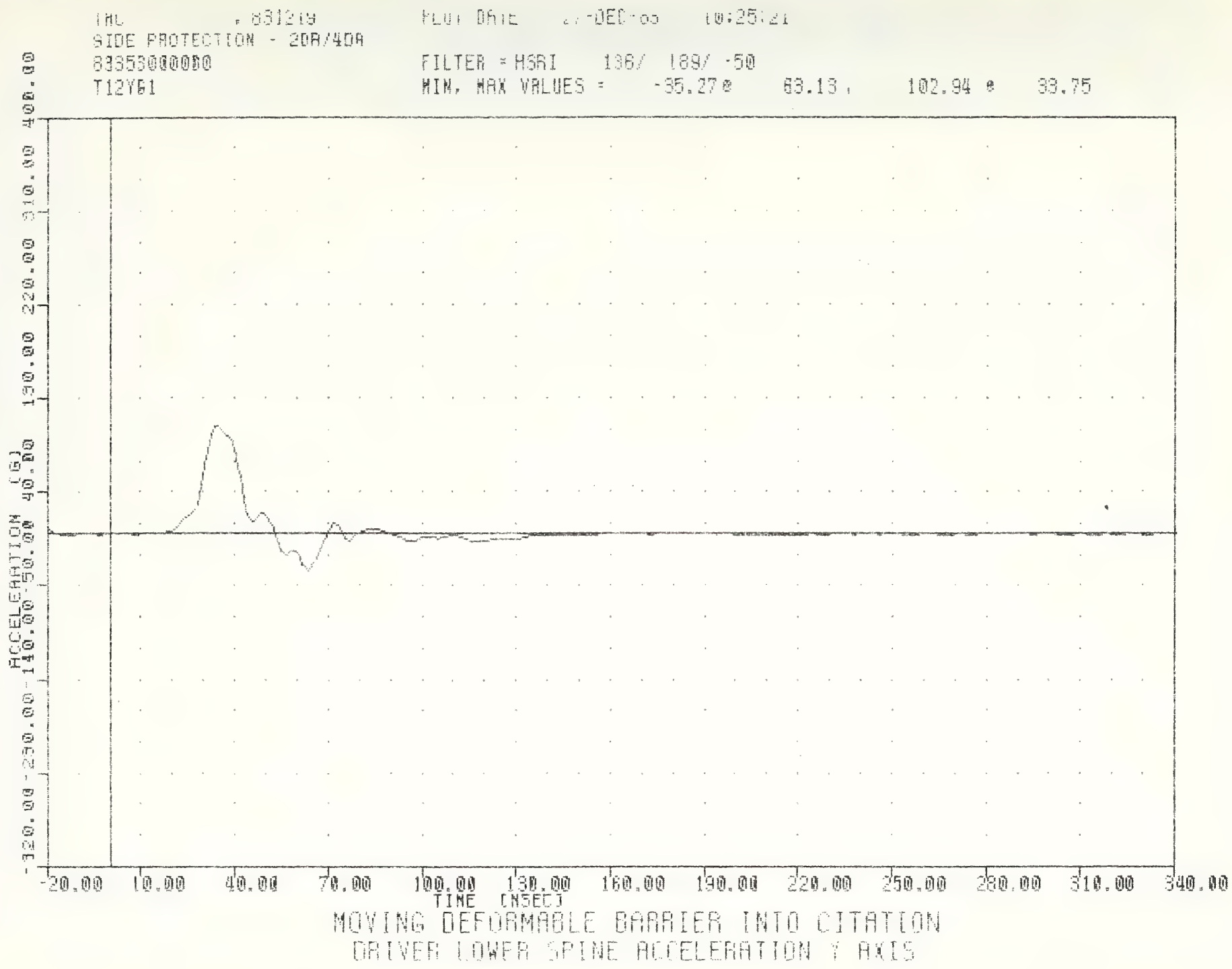
TRC , 831219 PLOT DATE 27-DEC-83 12:58:34
SIDE PROTECTION - 2DR/4DR
833530000000 FILTER = HSRI 136/ 189/ -50
T01YVA MIN. MAX VALUES = -0.22 @ 26.25 , 26.68 @ 60.00

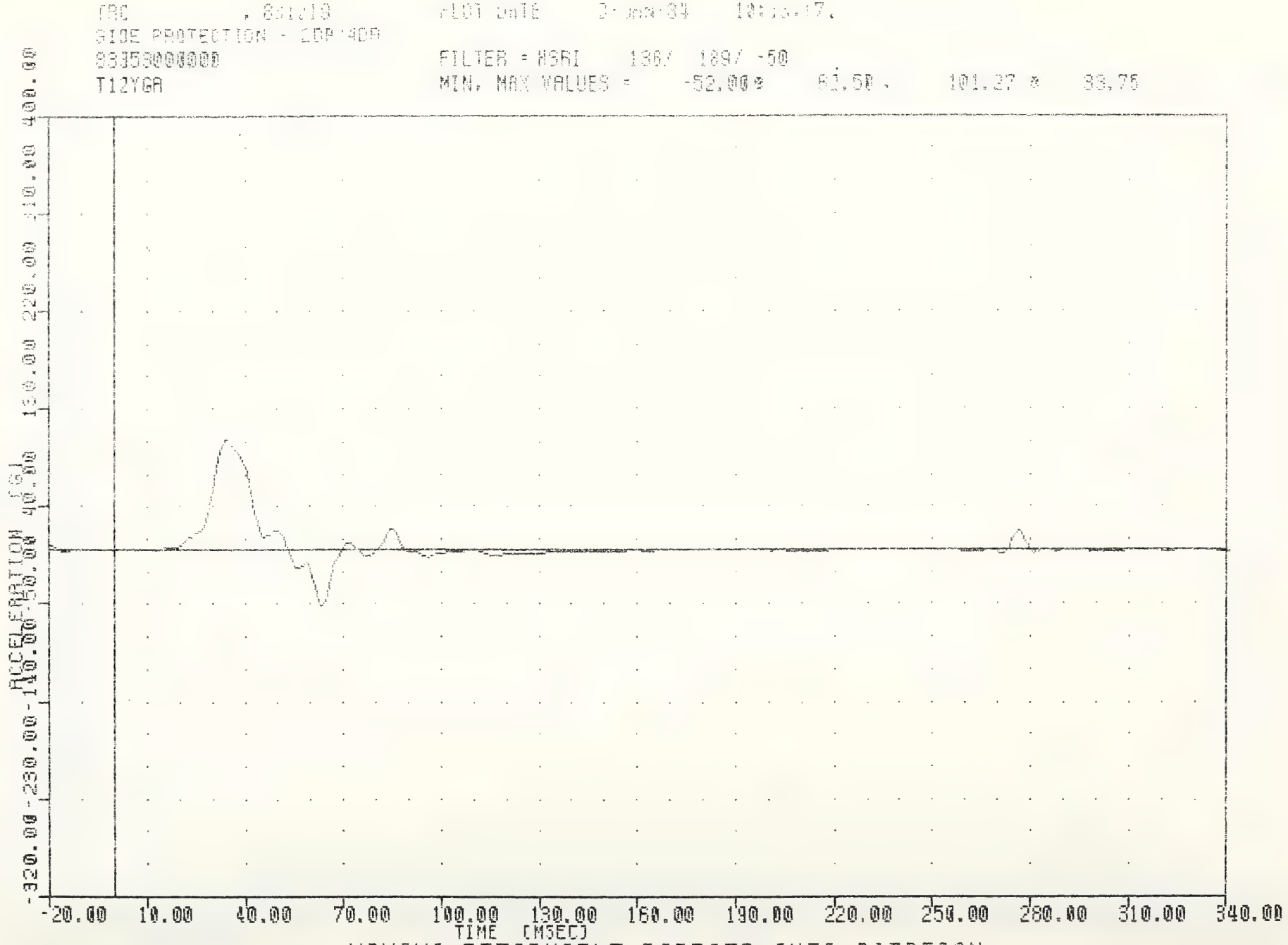


MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING T01YGA

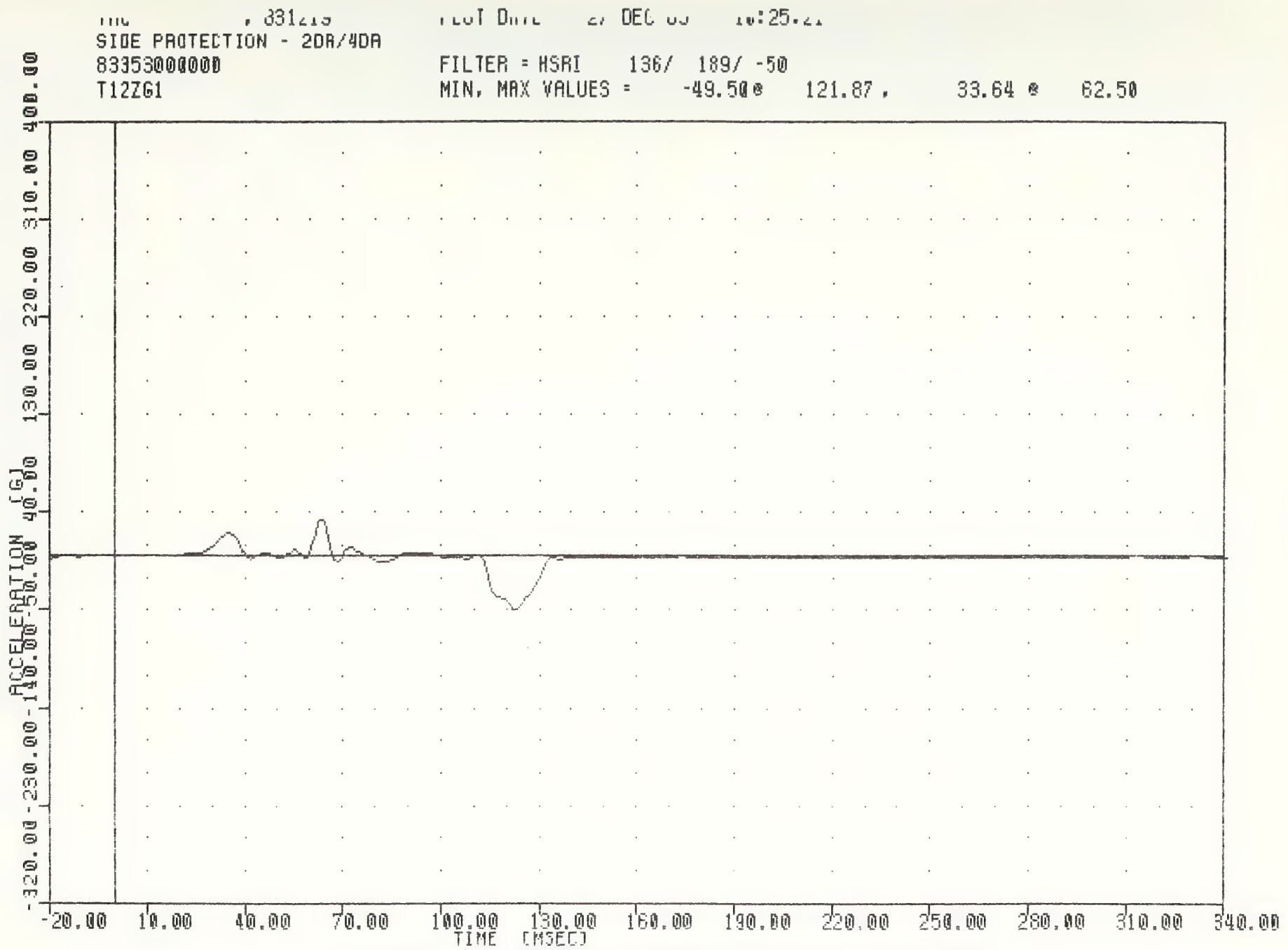


MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER LOWER SPINE ACCELERATION X AXIS

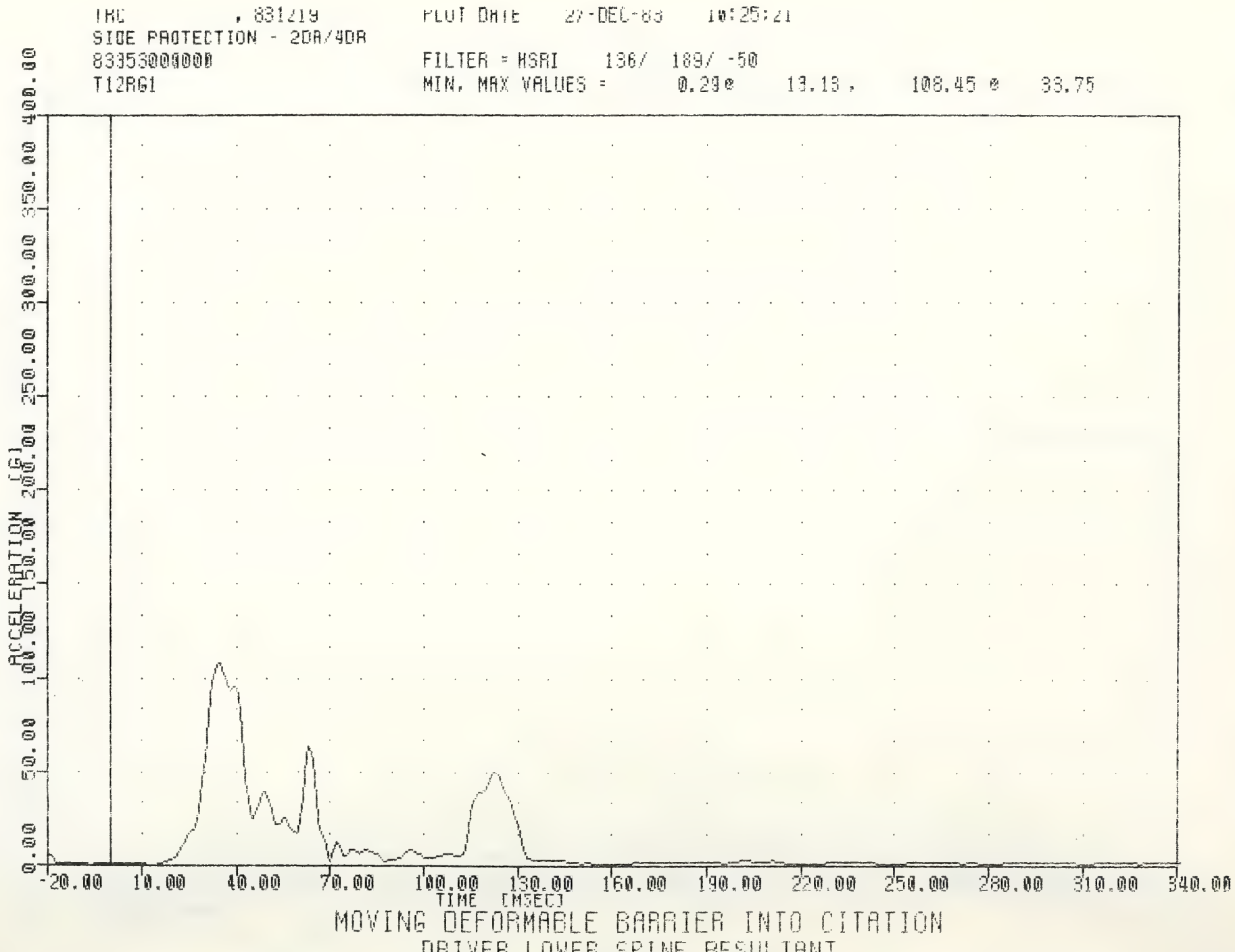

IHL , 831219
PLOT DATE 27-DEC-00 10:25:21
SIDE PROTECTION - 20A/40A
83353@@@@@@
T12YG1
FILTER = HSRI 136/ 189/ -50
MIN, MAX VALUES = -35.27@ 83.13, 102.94@ 38.75
ACCELERATION (G)
-320.00 -230.00 -140.00 -50.00 40.00 130.00 220.00 310.00 400.00
-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER LOWER SPINE ACCELERATION Y AXIS

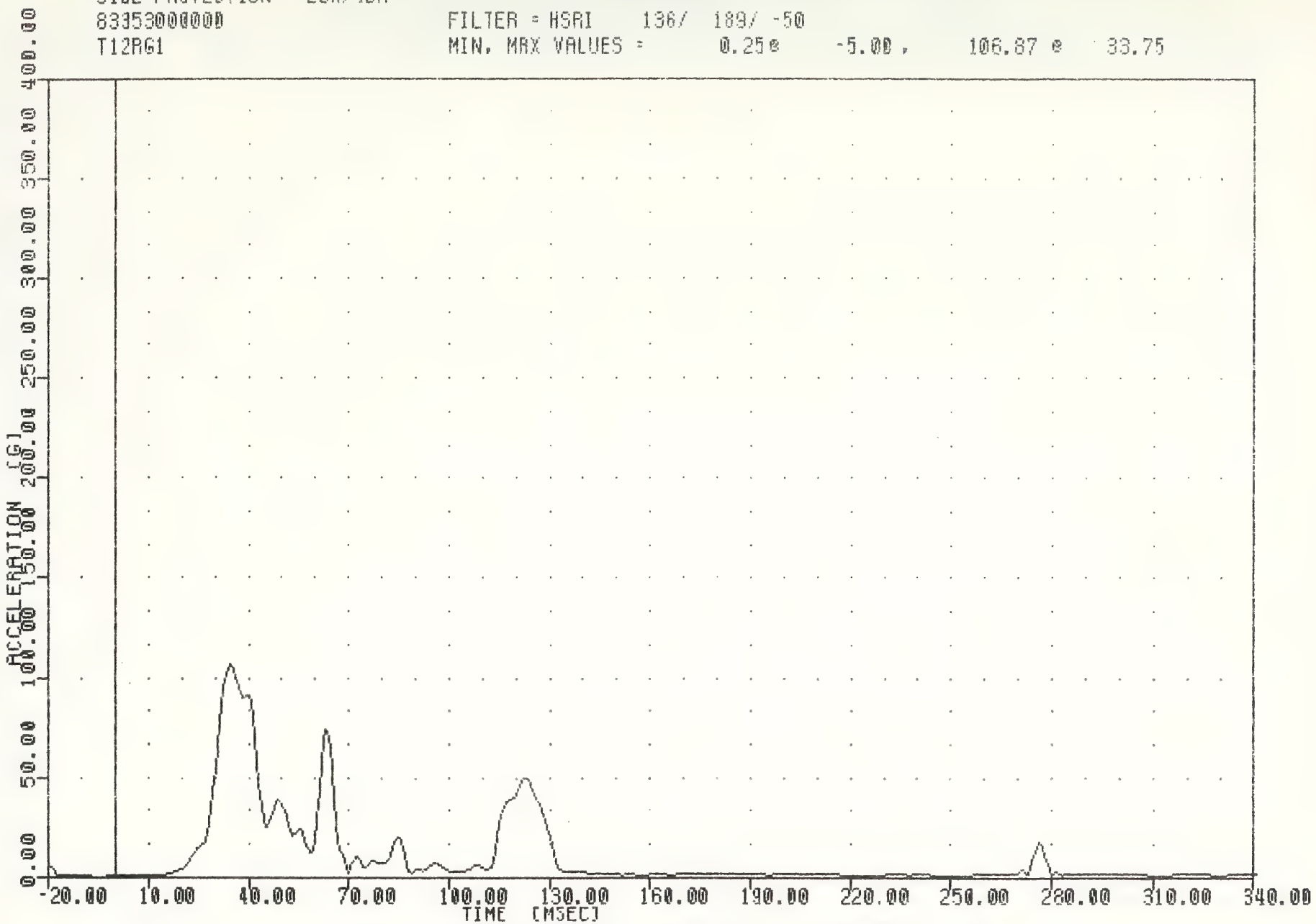


MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER LOWER SPINE ACCELERATION -Z Y AXIS

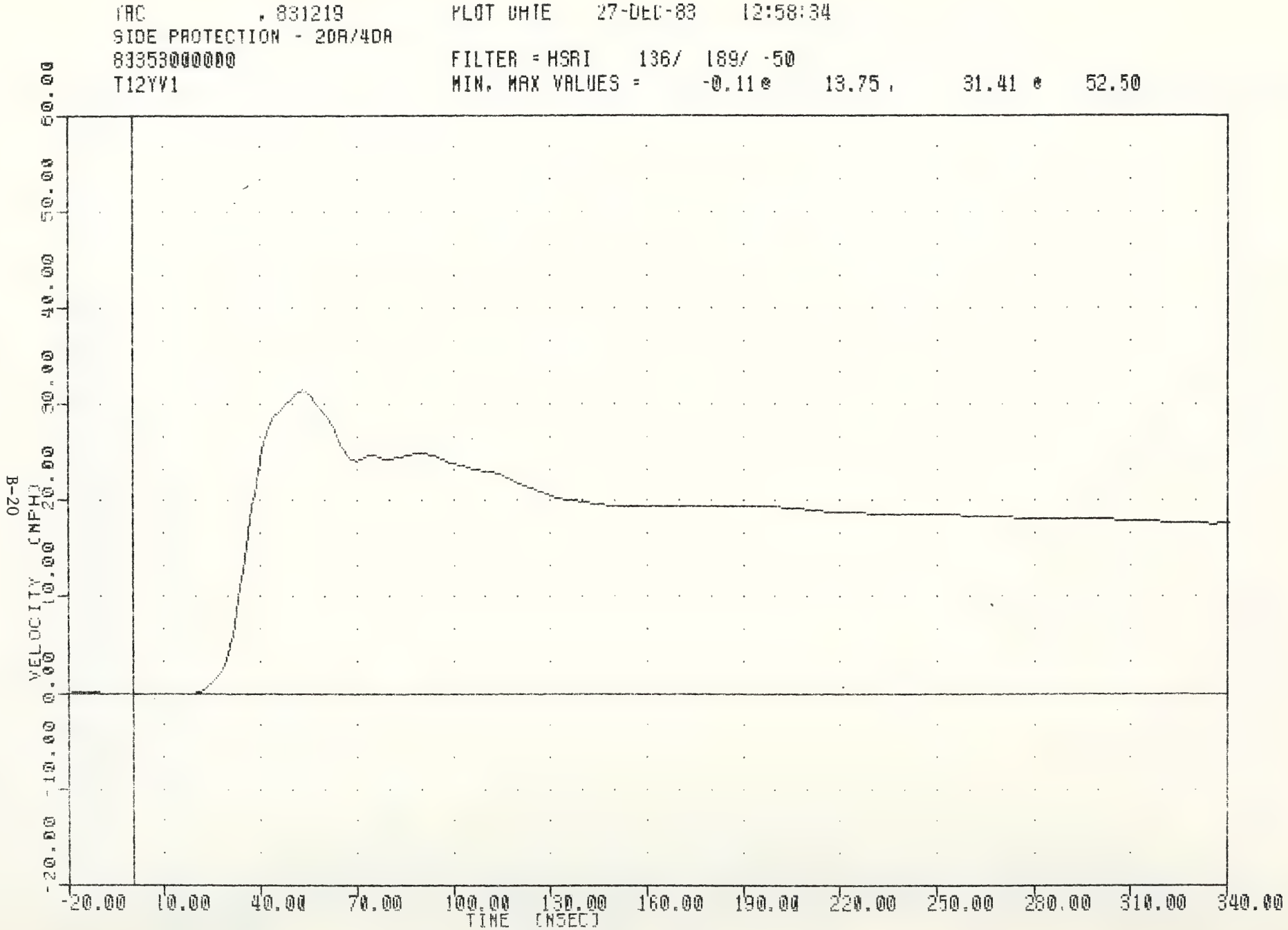


MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER LOWER SPINE ACCELERATION Z AXIS

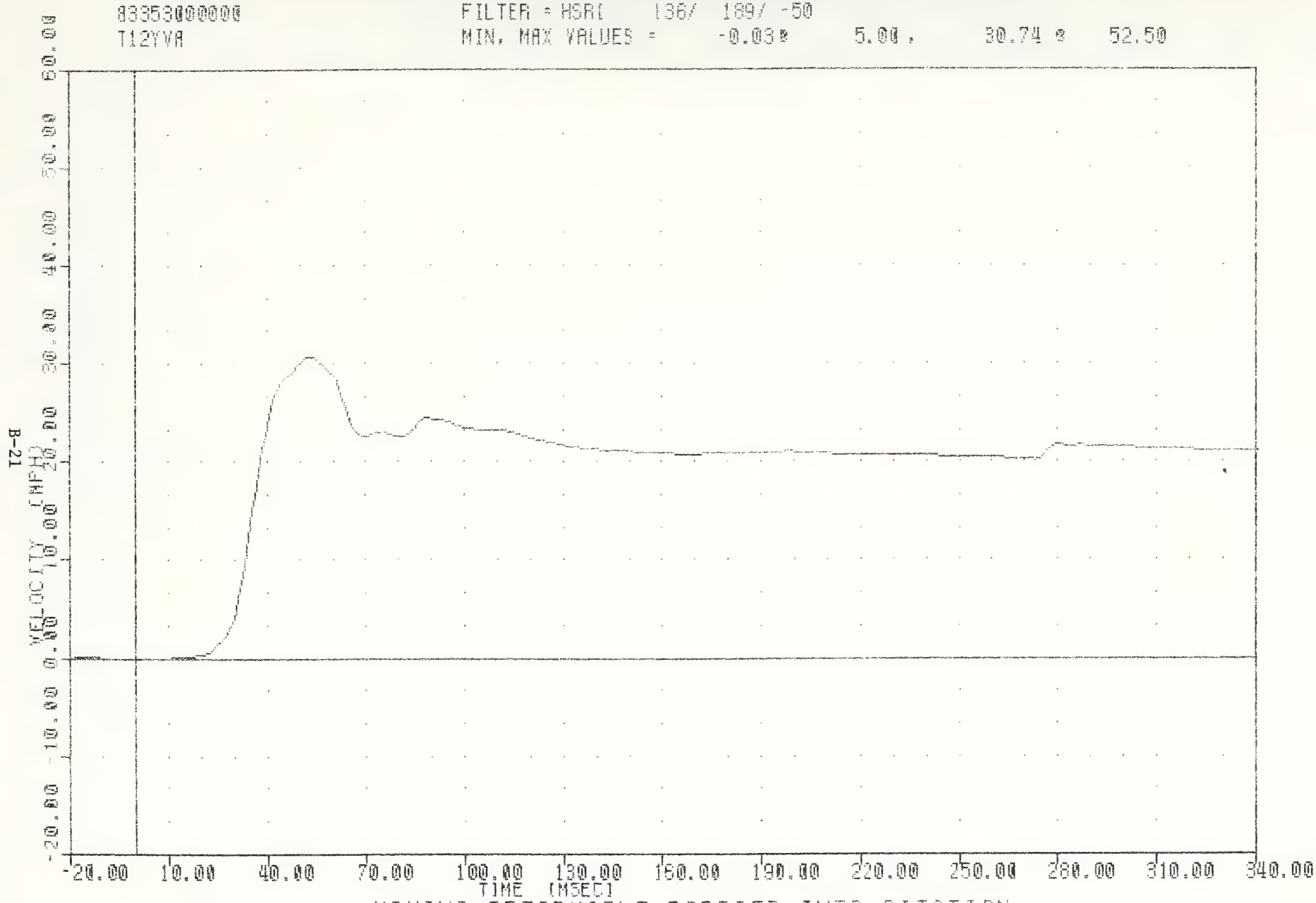

TRC , 831219
PLOT DATE 27-DEC-83 10:25:21
SIDE PROTECTION - 20A/40A
83353000000
FILTER = HSRI 136/ 189/ -50
T12RG1
MIN, MAX VALUES = 0.29@ 13.13 , 108.45 @ 33.75
ACCELERATION (G)
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER LOWER SPINE RESULTANT



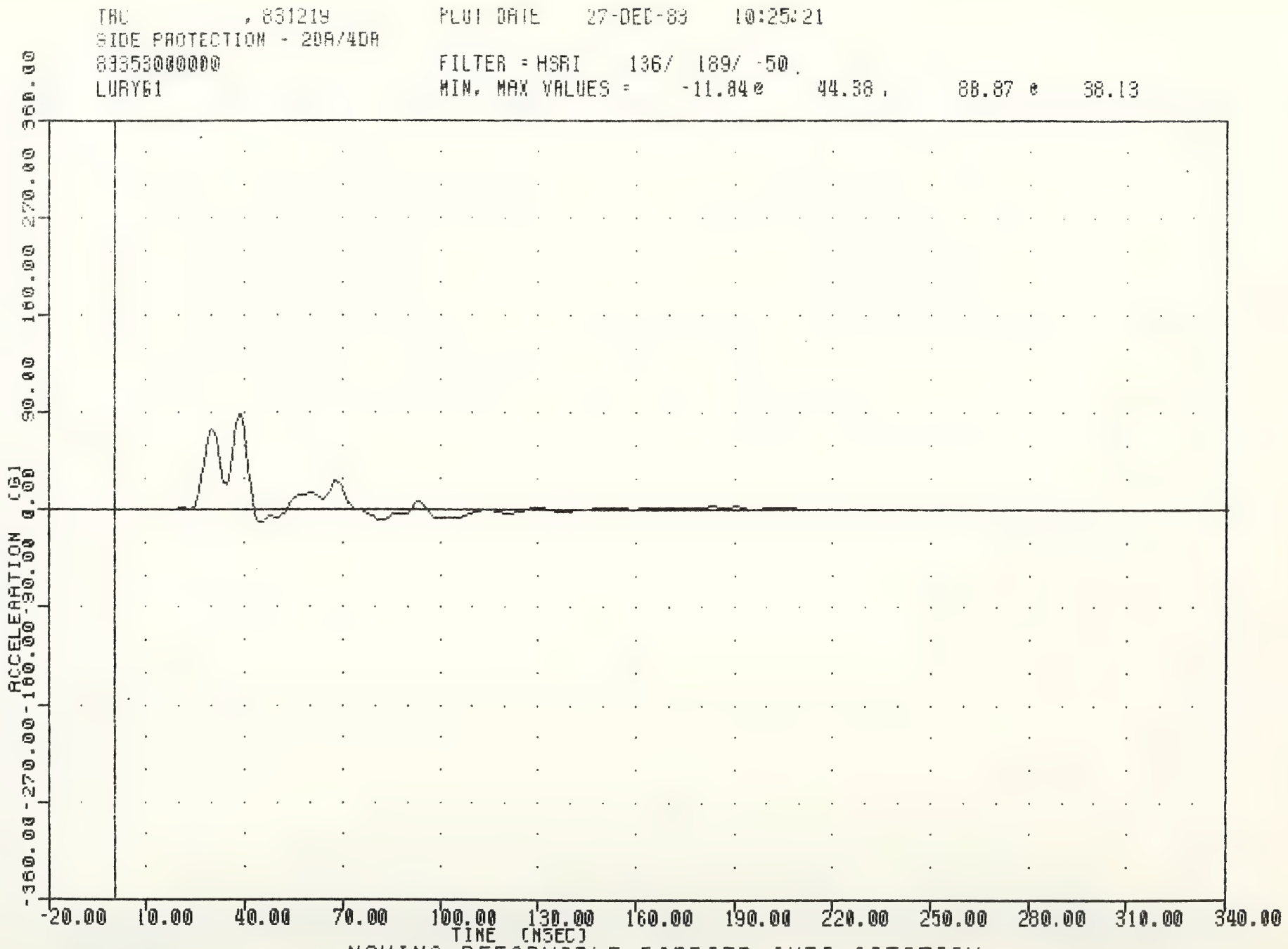
MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER LOWER SPINE RESULTANT USING T12YGA



MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING T12YG1

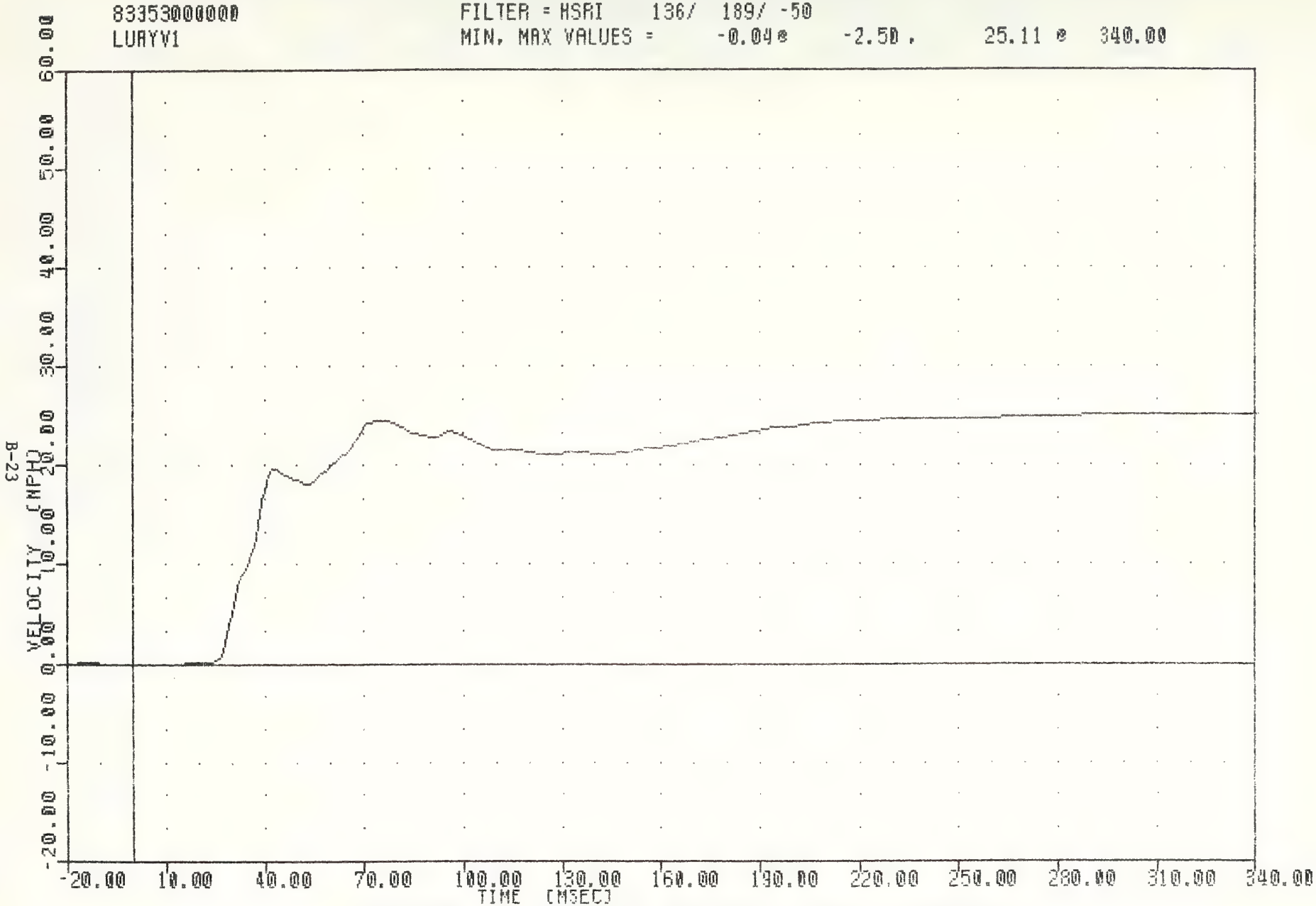


MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING T12YGR

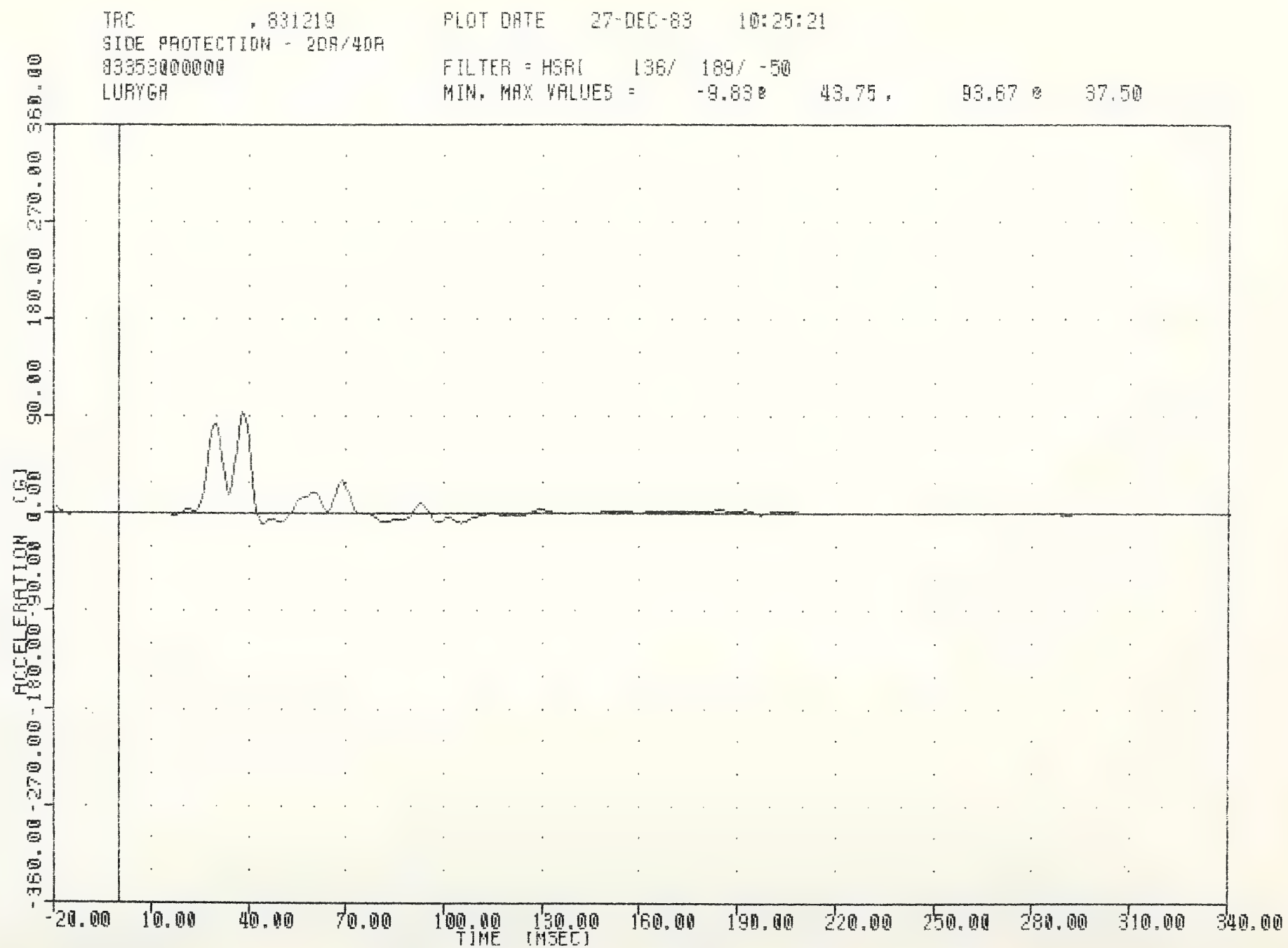


MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER LEFT UPPER RIB ACCELERATION Y AXIS

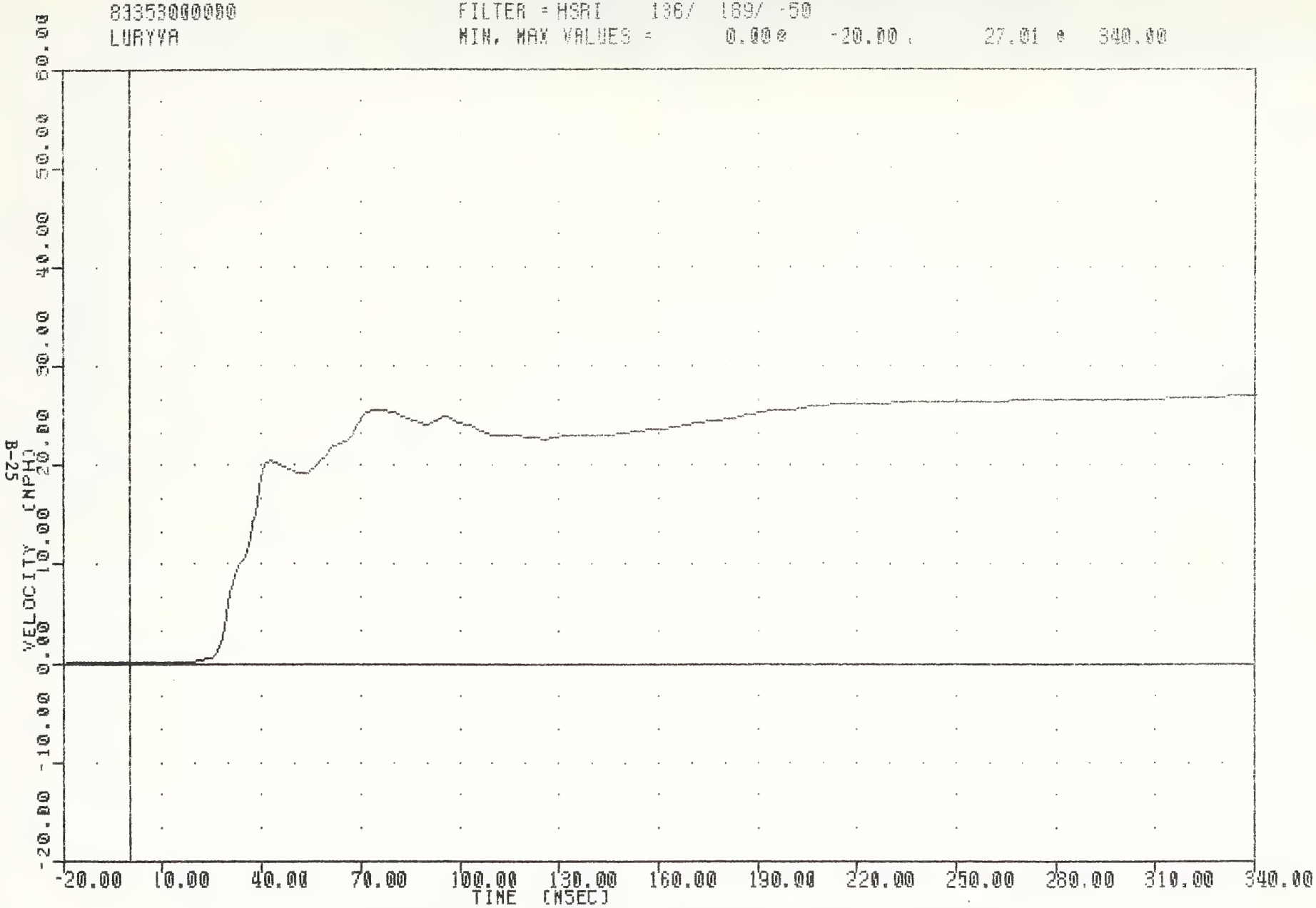
TRC , 831219 PLOT DATE 27-DEC-83 12:58:34
SIDE PROTECTION - 2DR/4DR
83353000000 FILTER = HSRI 136/ 189/ -50
LURYV1 MIN, MAX VALUES = -0.04 @ -2.50 , 25.11 @ 340.00



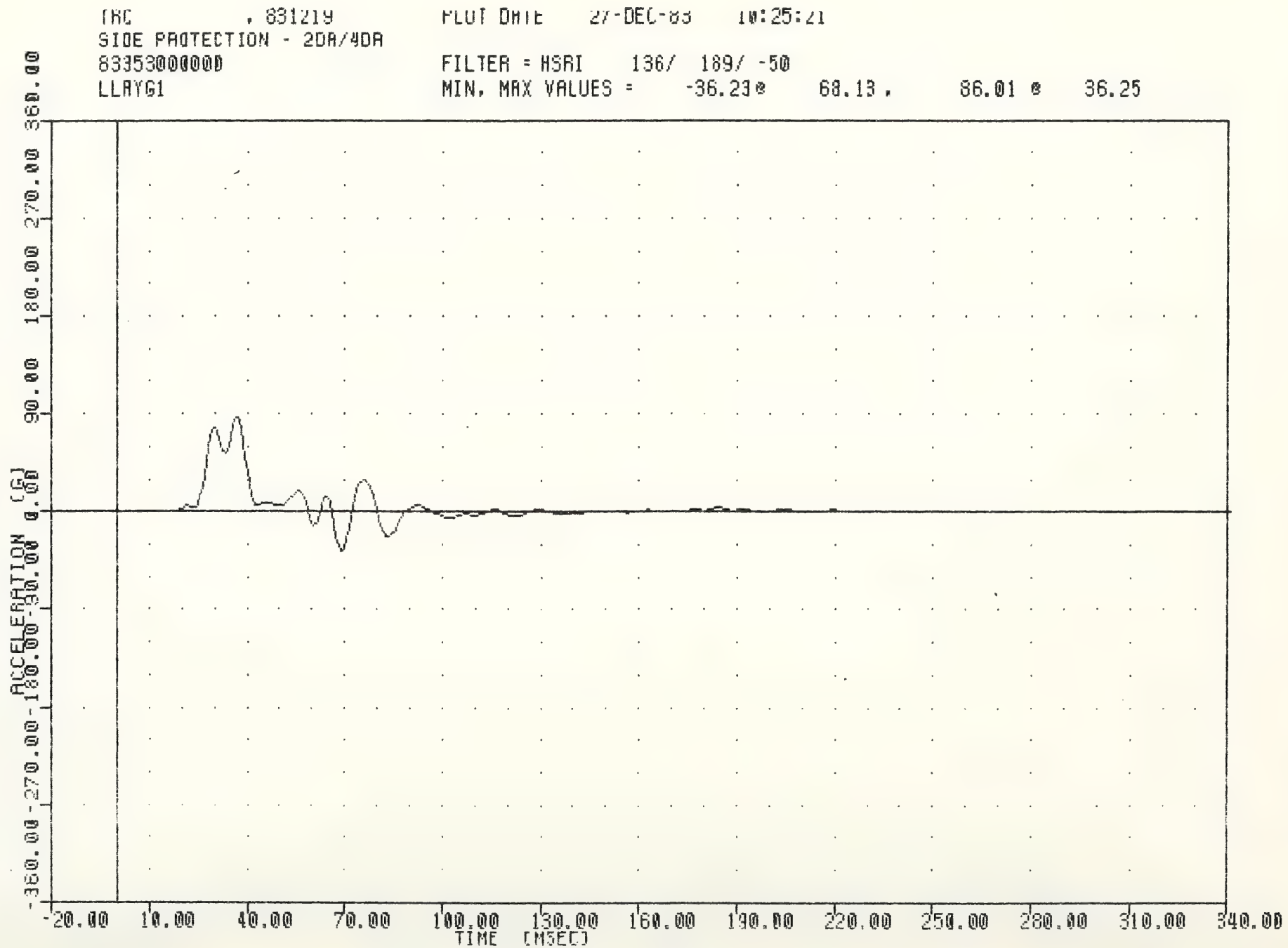
MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING LURYG1



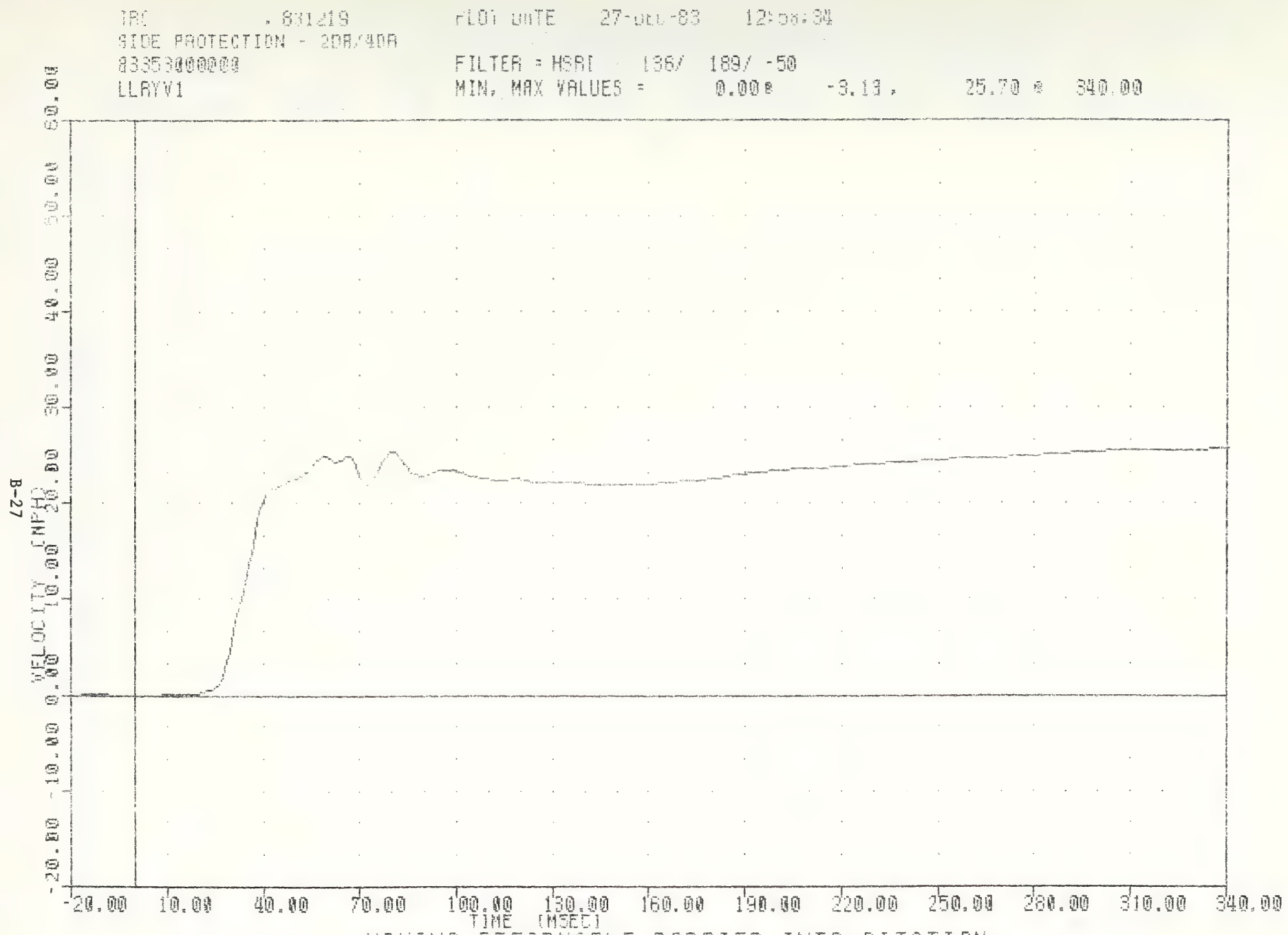
MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER LEFT UPPER RIB ACCELERATION -2 Y AXIS



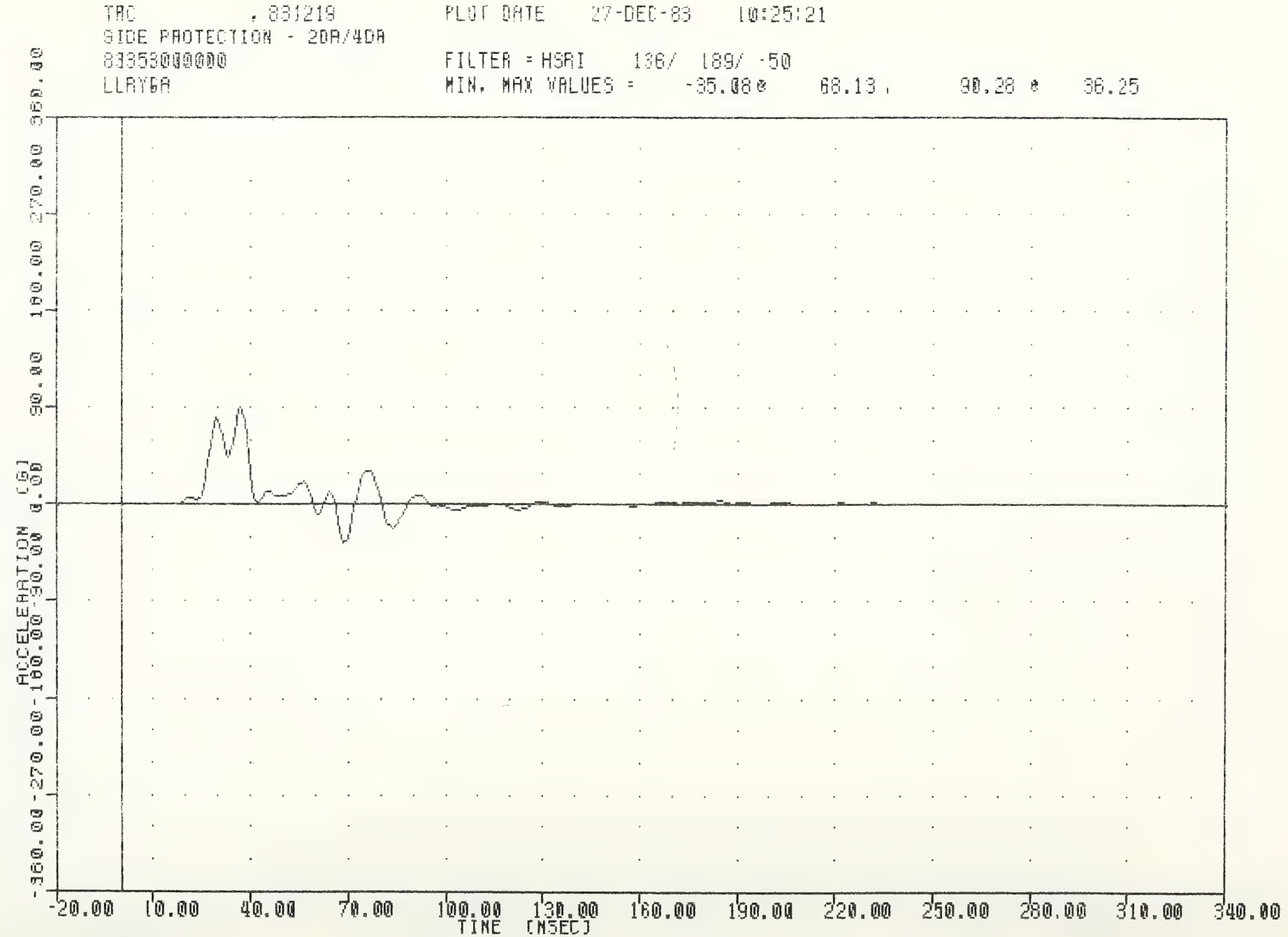
MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING LURYGA



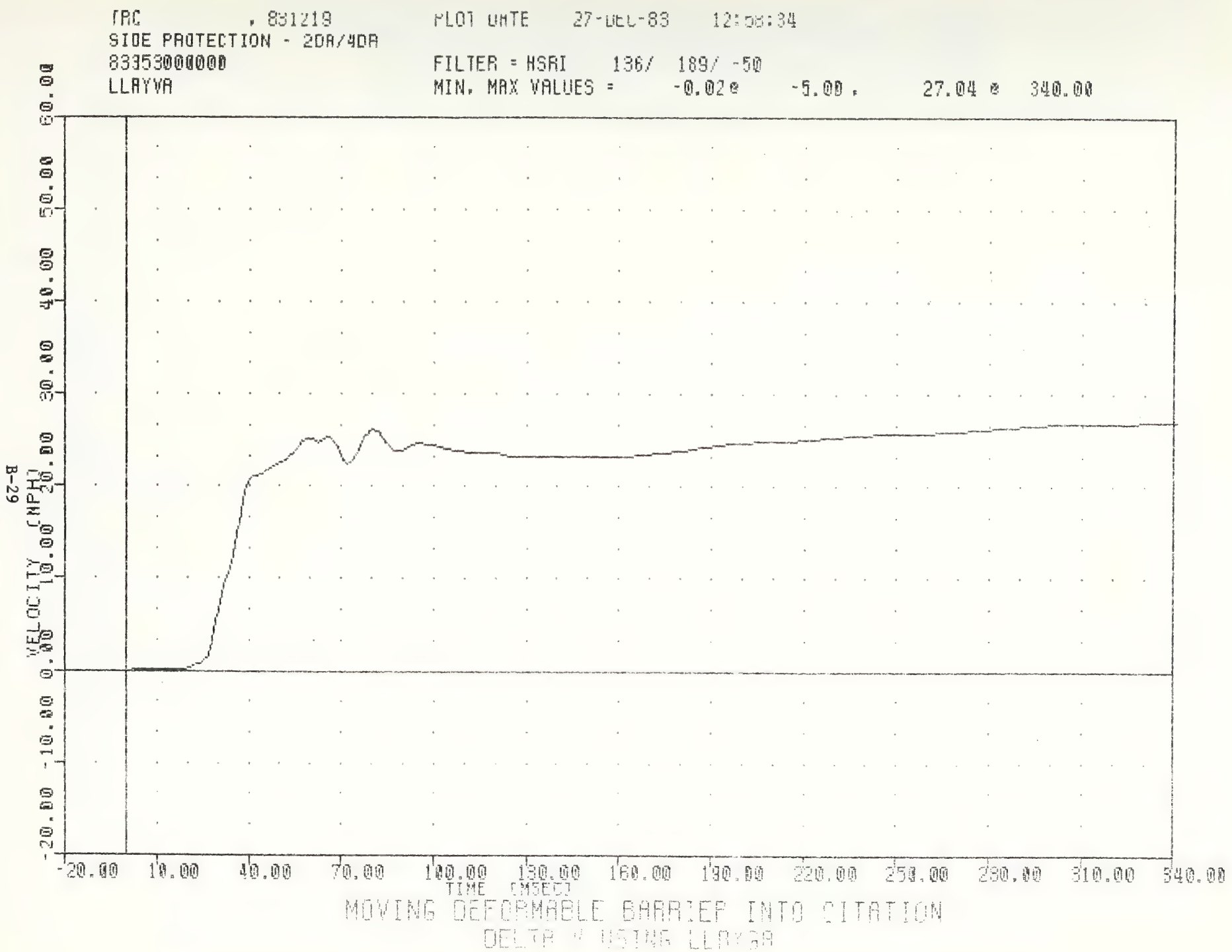
MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER LEFT LOWER RIB ACCELERATION Y AXIS

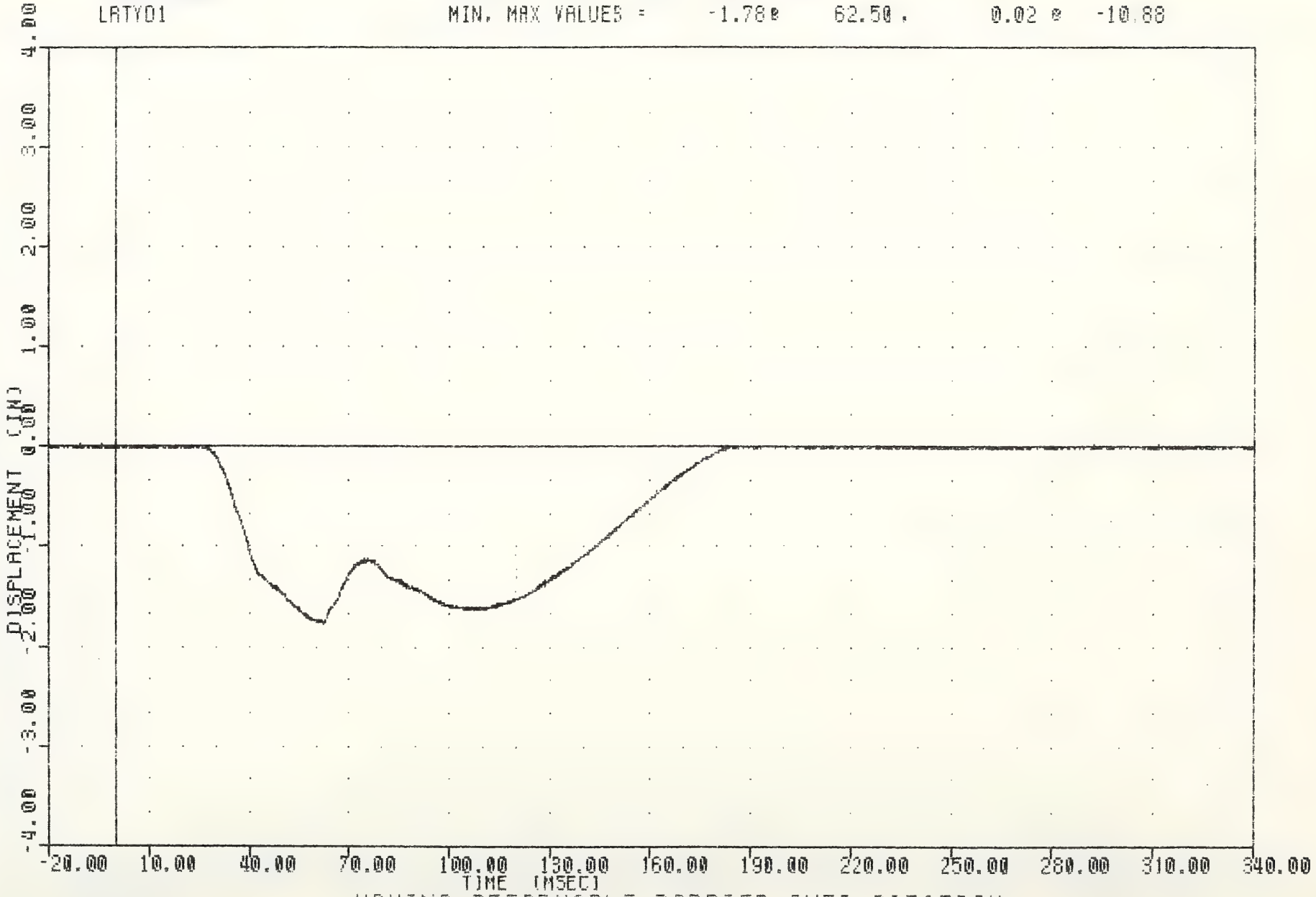


MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING LLAYG1

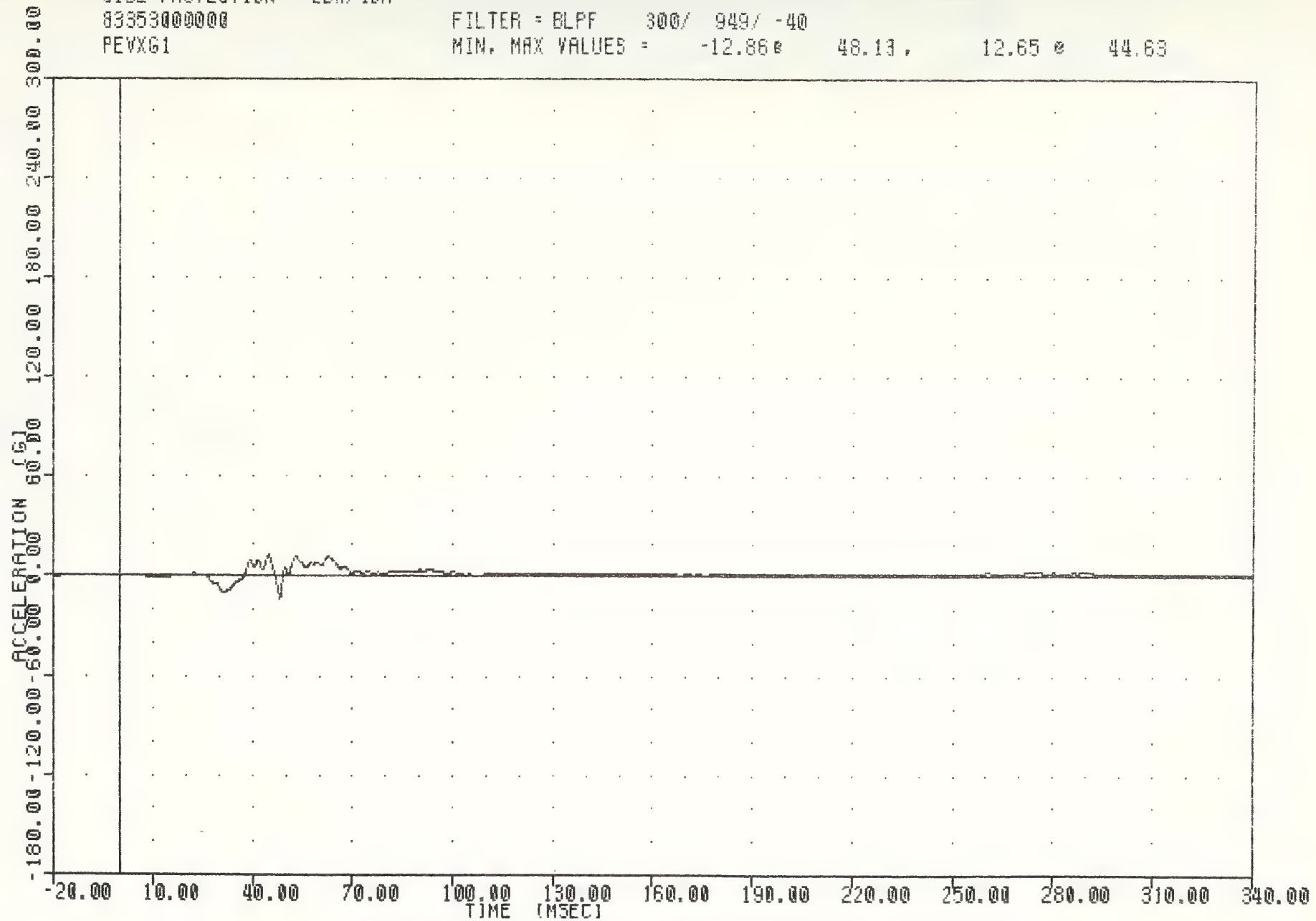


MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER LEFT LOWER RIB ACCELERATION -2 Y AXIS

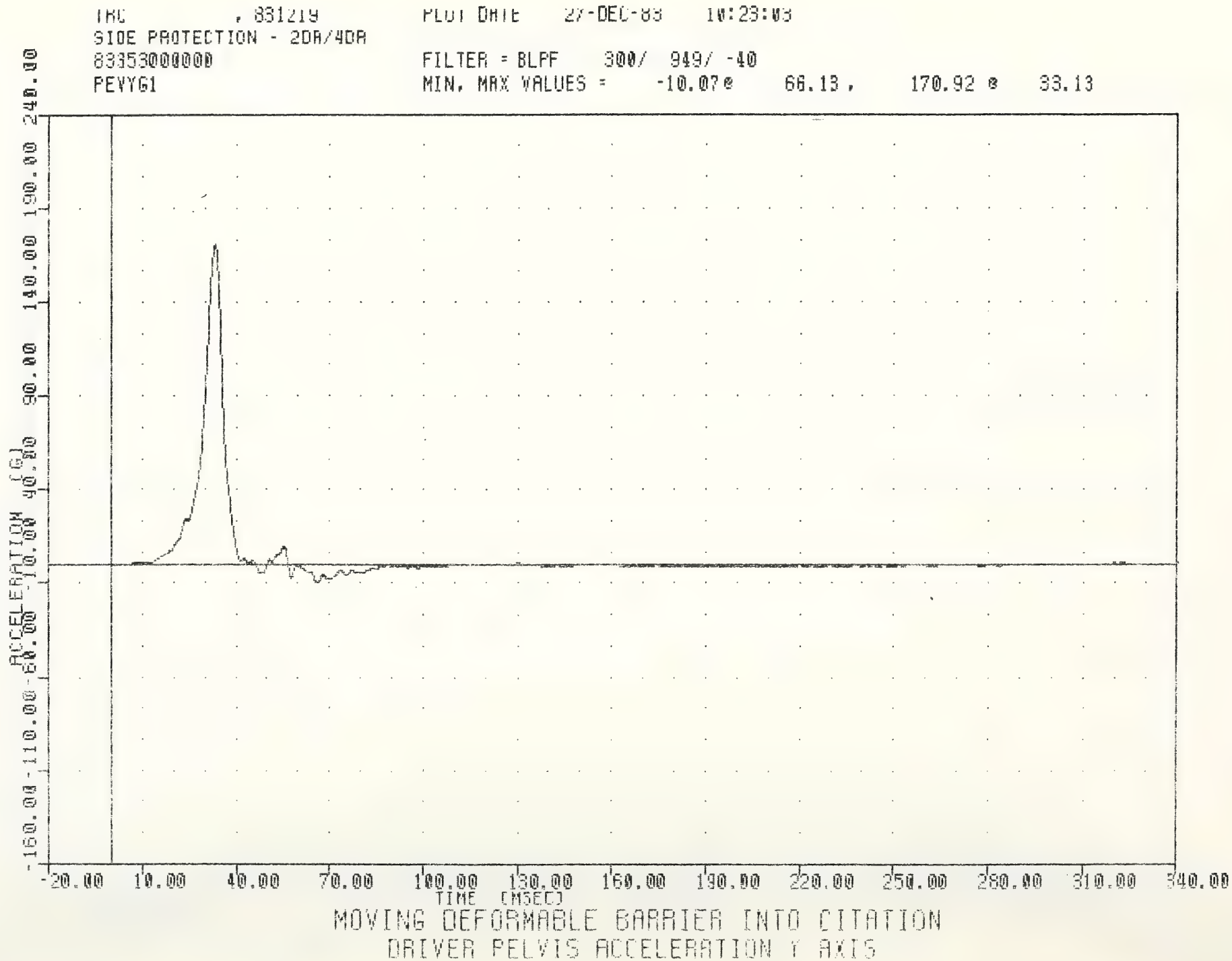

TRC , 831219
PLOT DATE 27-DEC-83 12:58:34
SIDE PROTECTION - 2DR/4DR
8335300000
FILTER = HSRI 136/ 189/ -50
LLAYVA
MIN, MAX VALUES = -0.02 @ -5.00 , 27.04 @ 340.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
VELOCITY (MPH)
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING LLAYGA

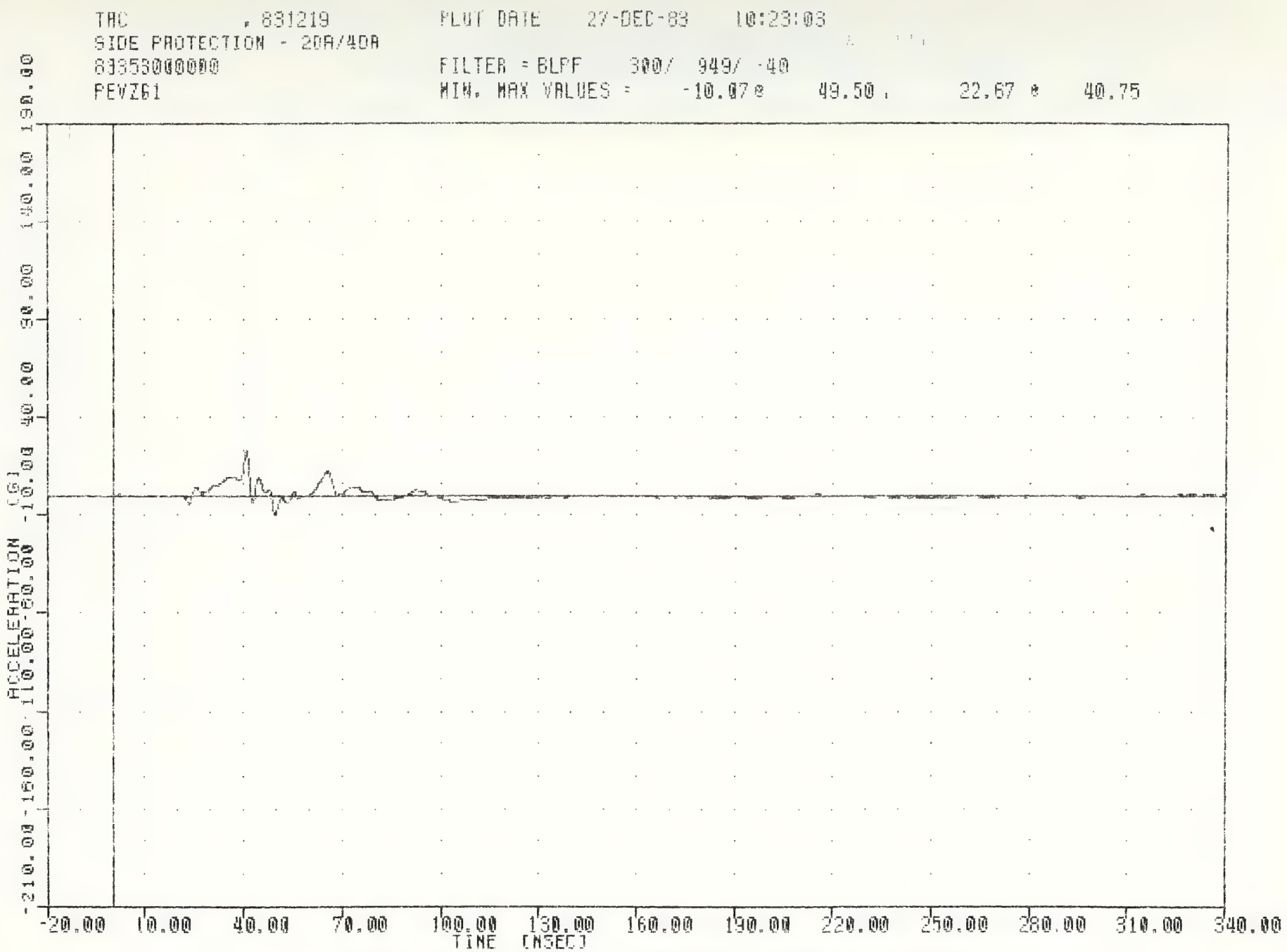


MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER LEFT RIB TO SPINE DISPLACEMENT INCHES

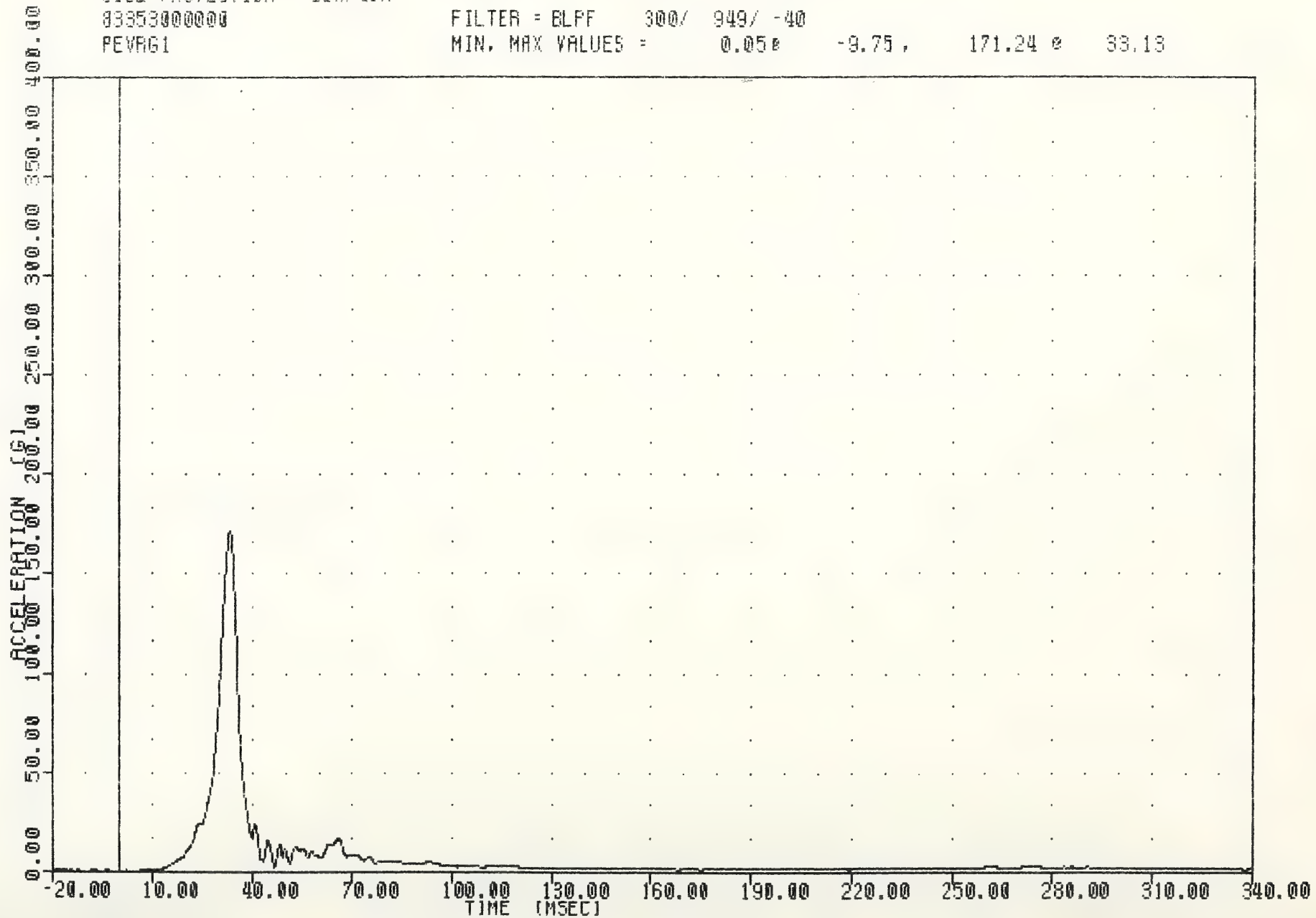


MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER PELVIS ACCELERATION X AXIS

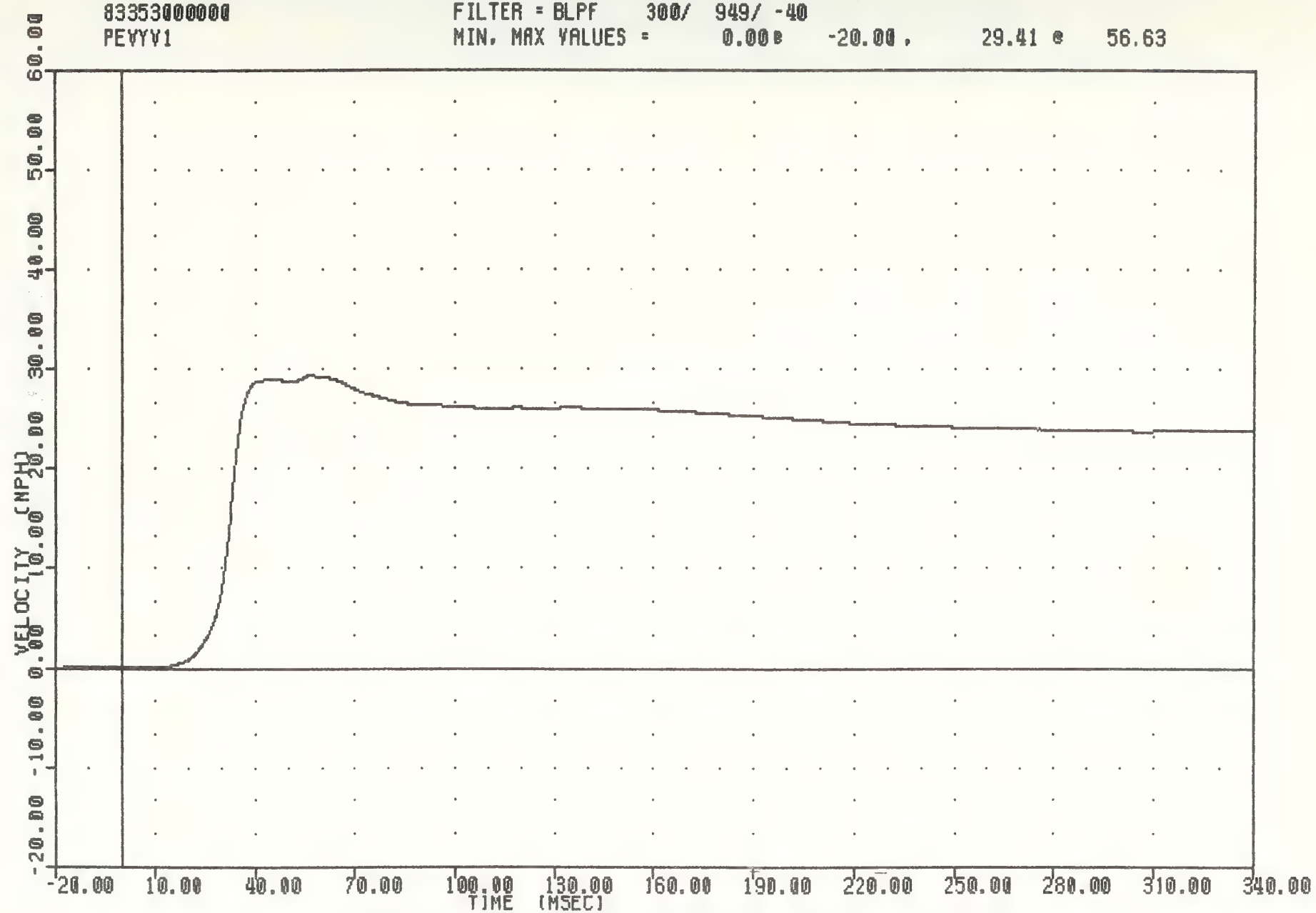

IRC , 831219
PLOT DATE 27-DEC-83 10:23:03
SIDE PROTECTION - 2DA/4DA
83353000000
FILTER = BLPF 300/ 949/ -40
PEVYG1
MIN, MAX VALUES = -10.07 @ 66.13 , 170.92 @ 33.13
240.00
190.00
140.00
90.00
40.00
-10.00
-60.00
-110.00
-160.00
ACCELERATION (G)
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER PELVIS ACCELERATION Y AXIS



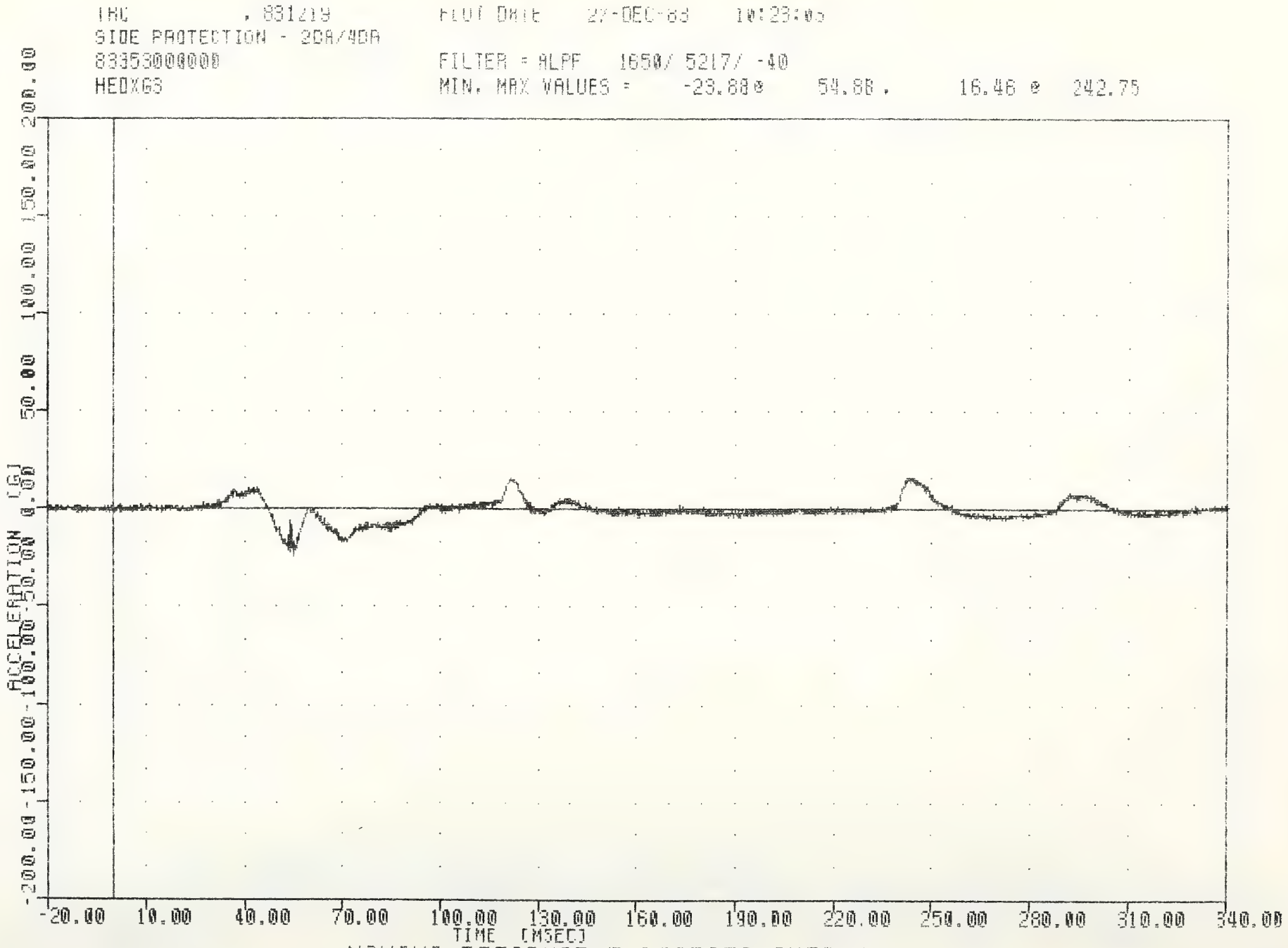
MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER PELVIS ACCELERATION Z AXIS



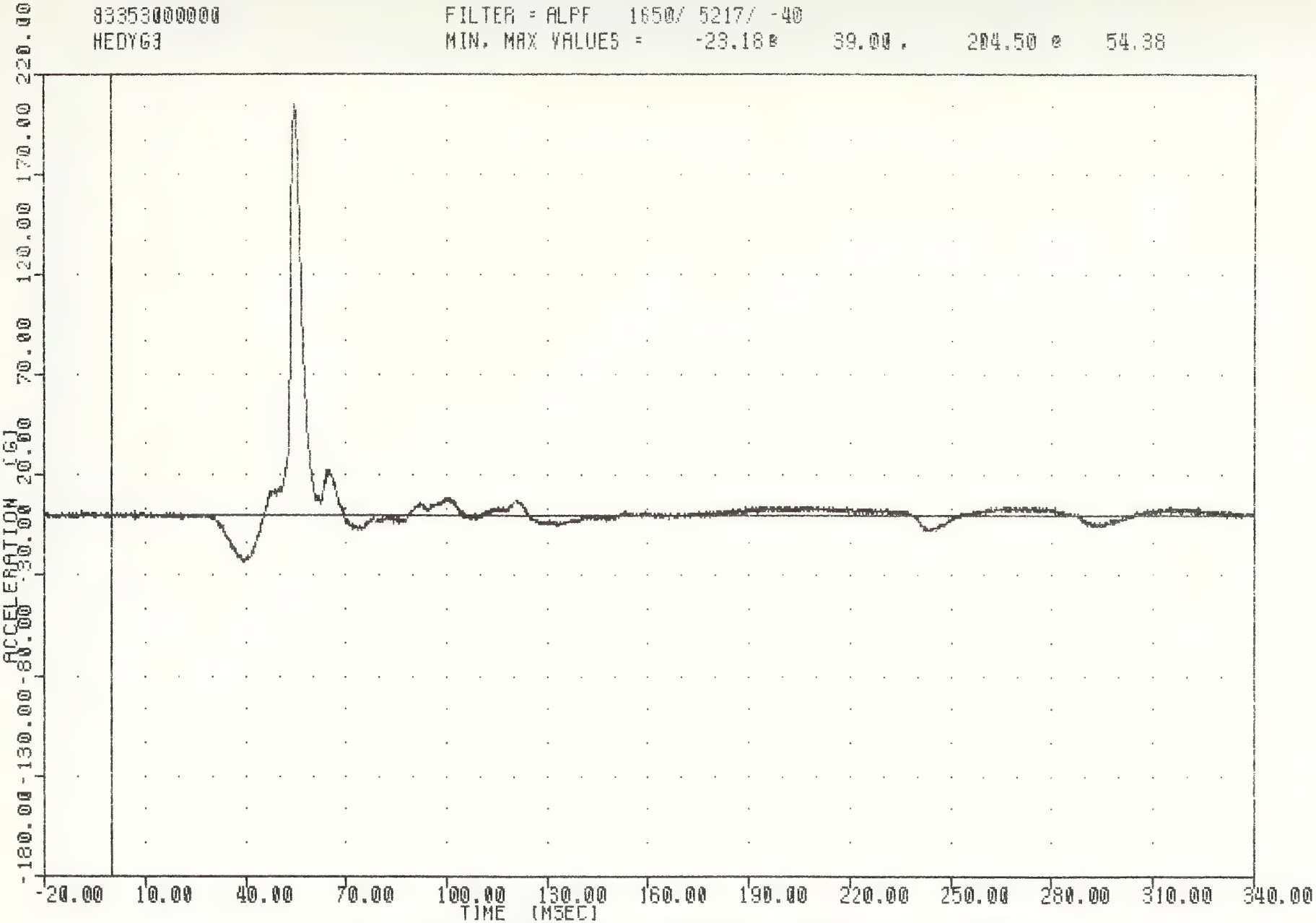
MOVING DEFORMABLE BARRIER INTO CITATION
DRIVER PELVIS RESULTANT



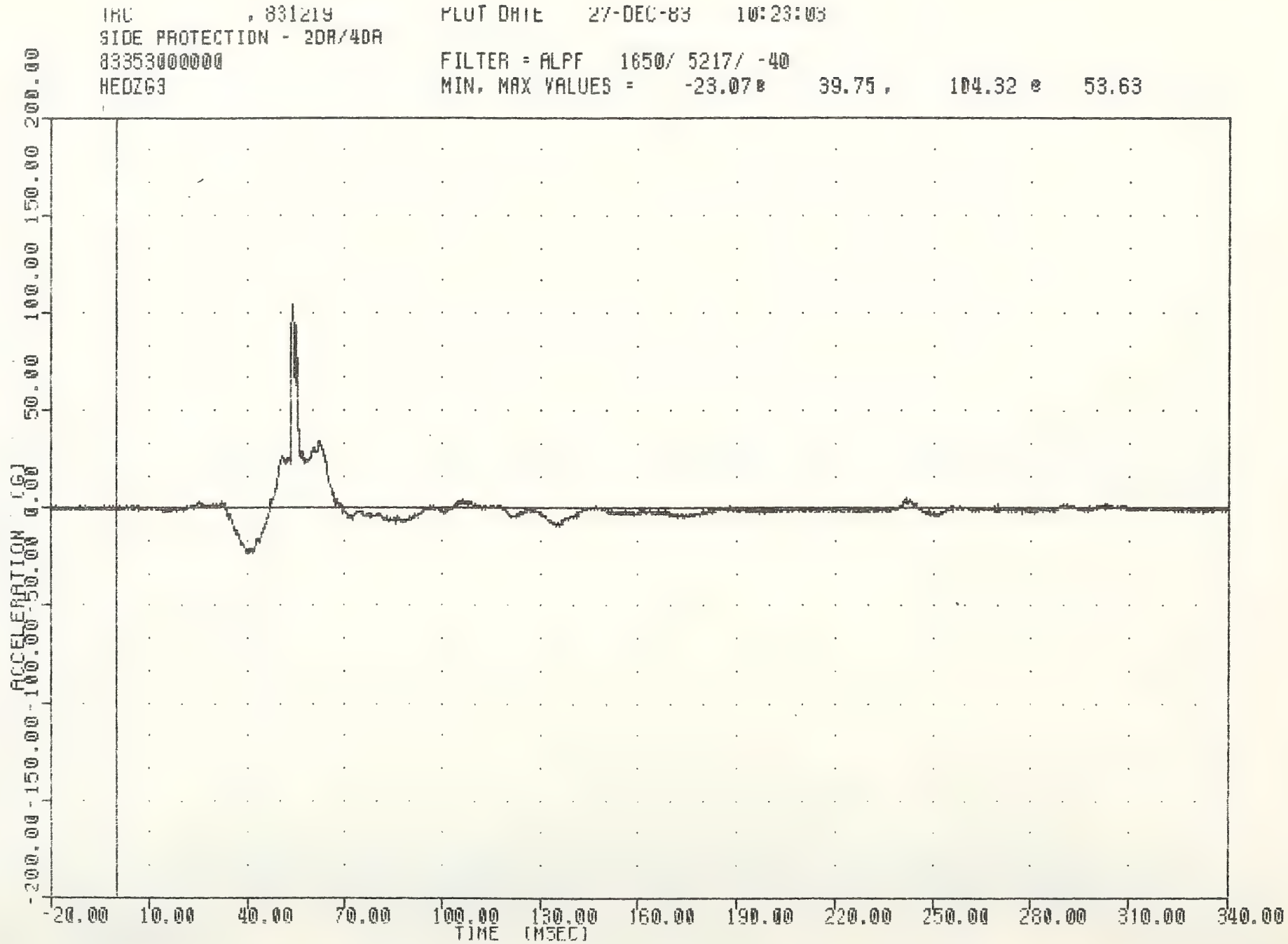
MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING PEVYG1



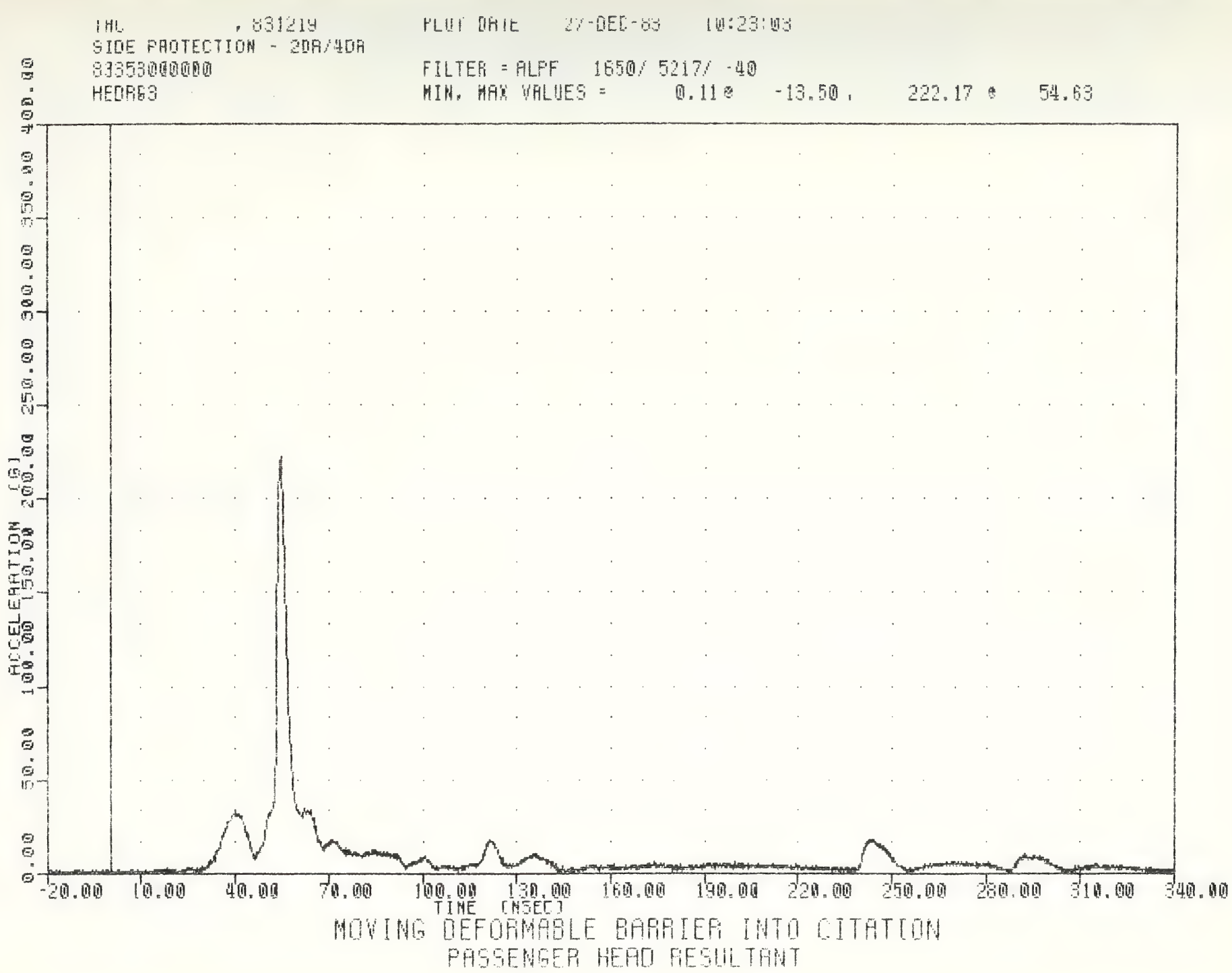
MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER HEAD ACCELERATION X AXIS

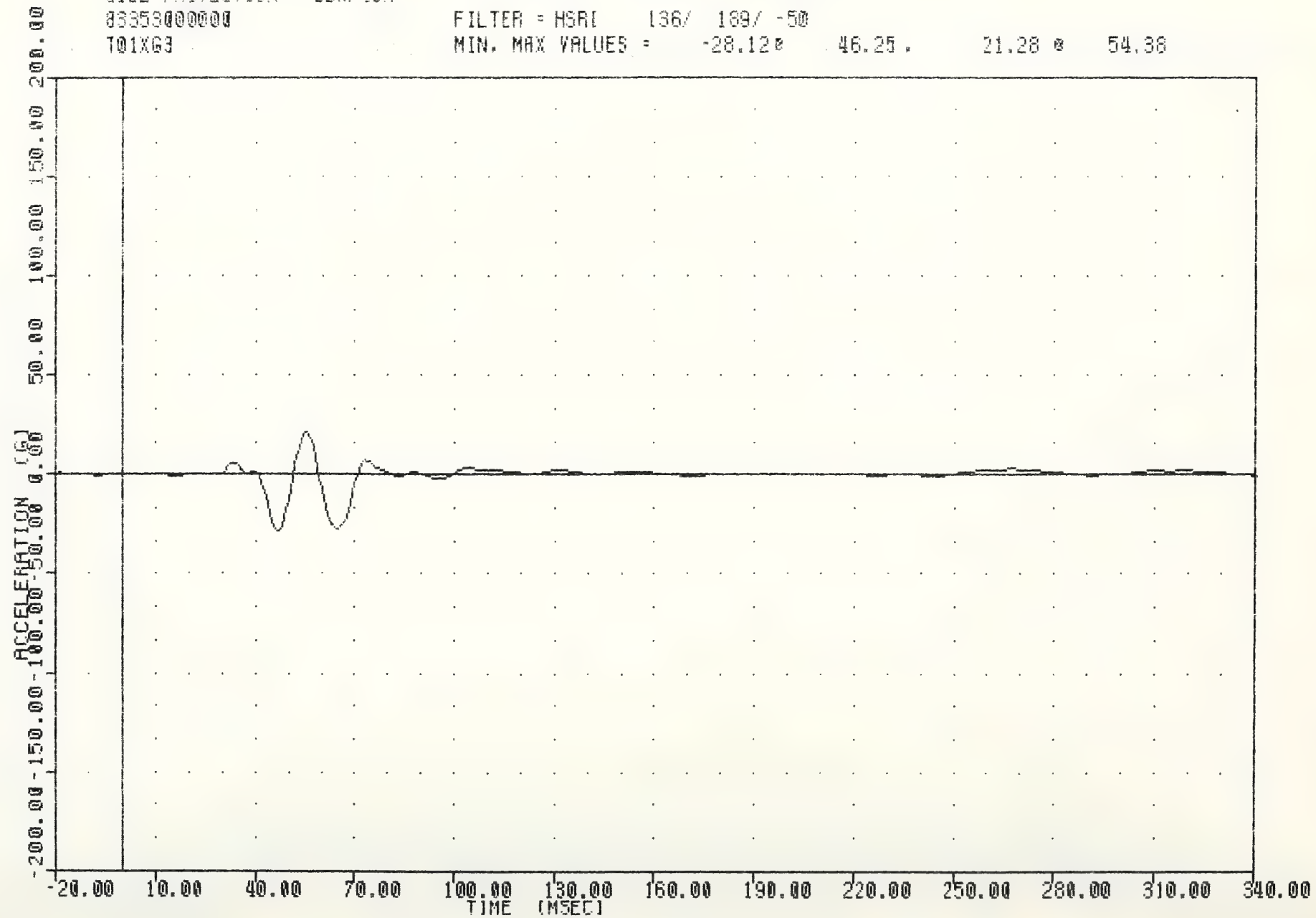


MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER HEAD ACCELERATION Y AXIS

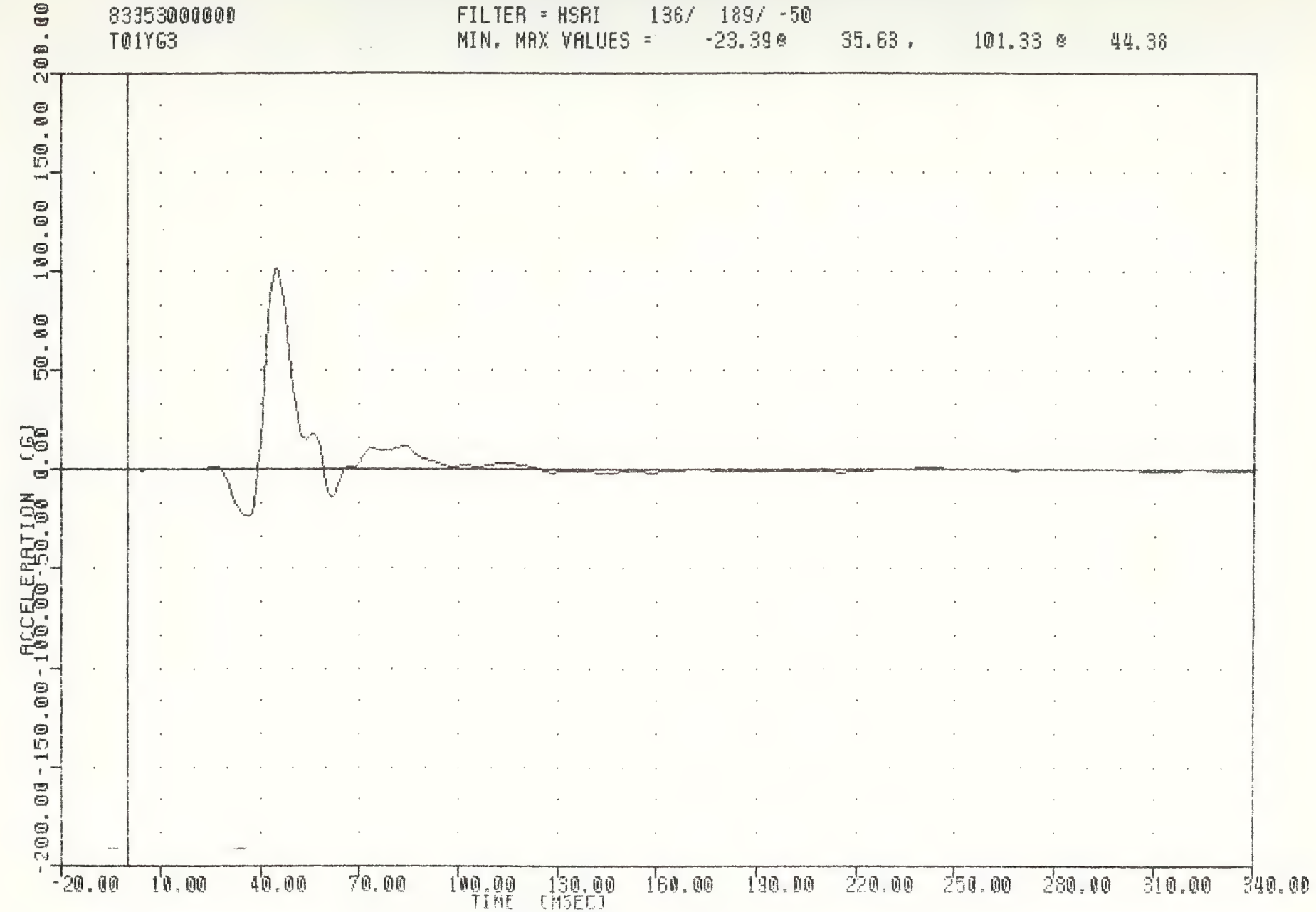


MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER HEAD ACCELERATION Z AXIS

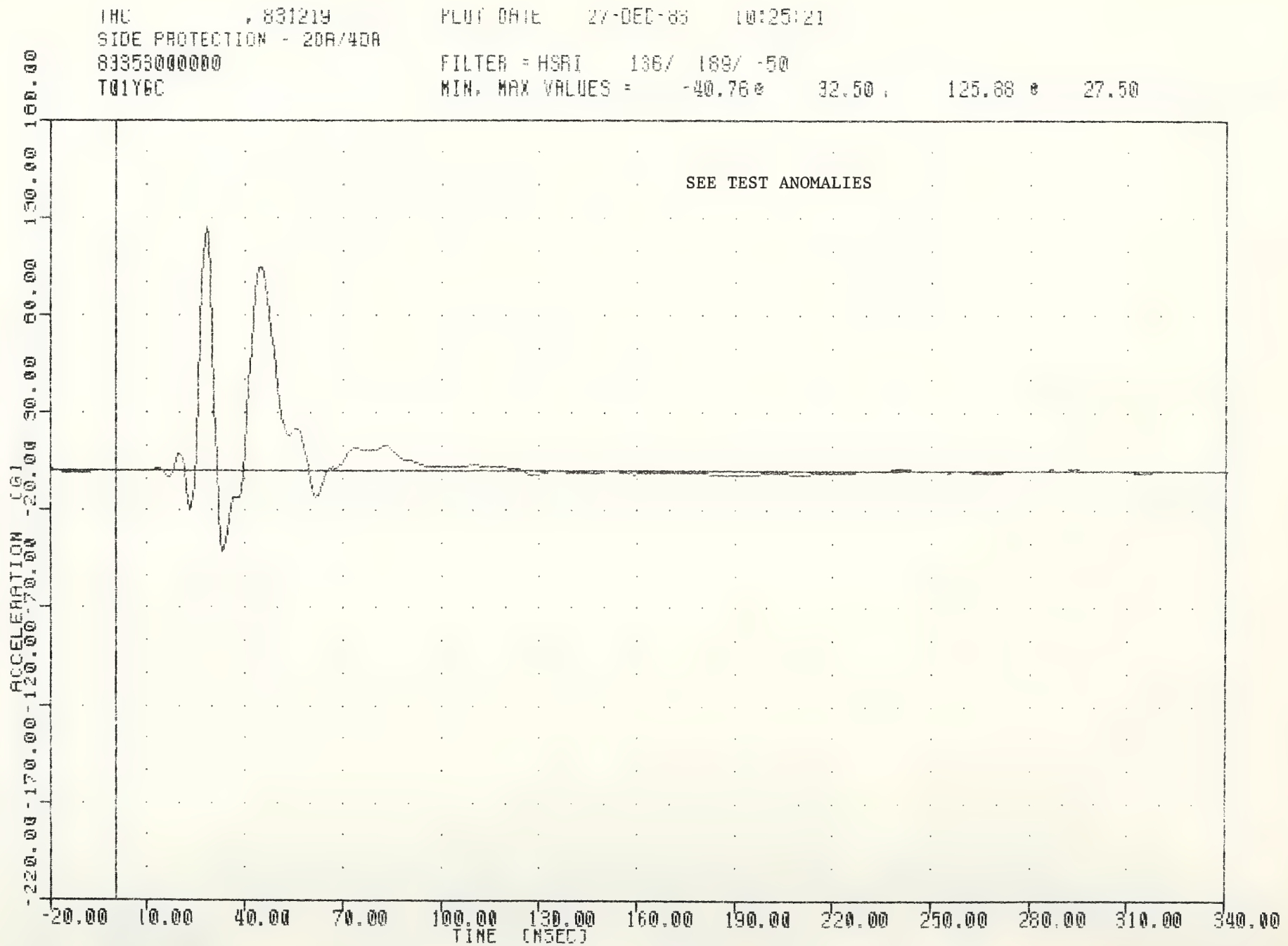

THL , 831219 PLOT DATE 27-DEC-83 10:23:03
SIDE PROTECTION - 20A/40A
83353@@@@@@
FILTER = ALPF 1650/ 5217/ -40
HEDR63
MIN, MAX VALUES = 0.11 @ -13.50 , 222.17 @ 54.63
ACCELERATION (G)
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER HEAD RESULTANT



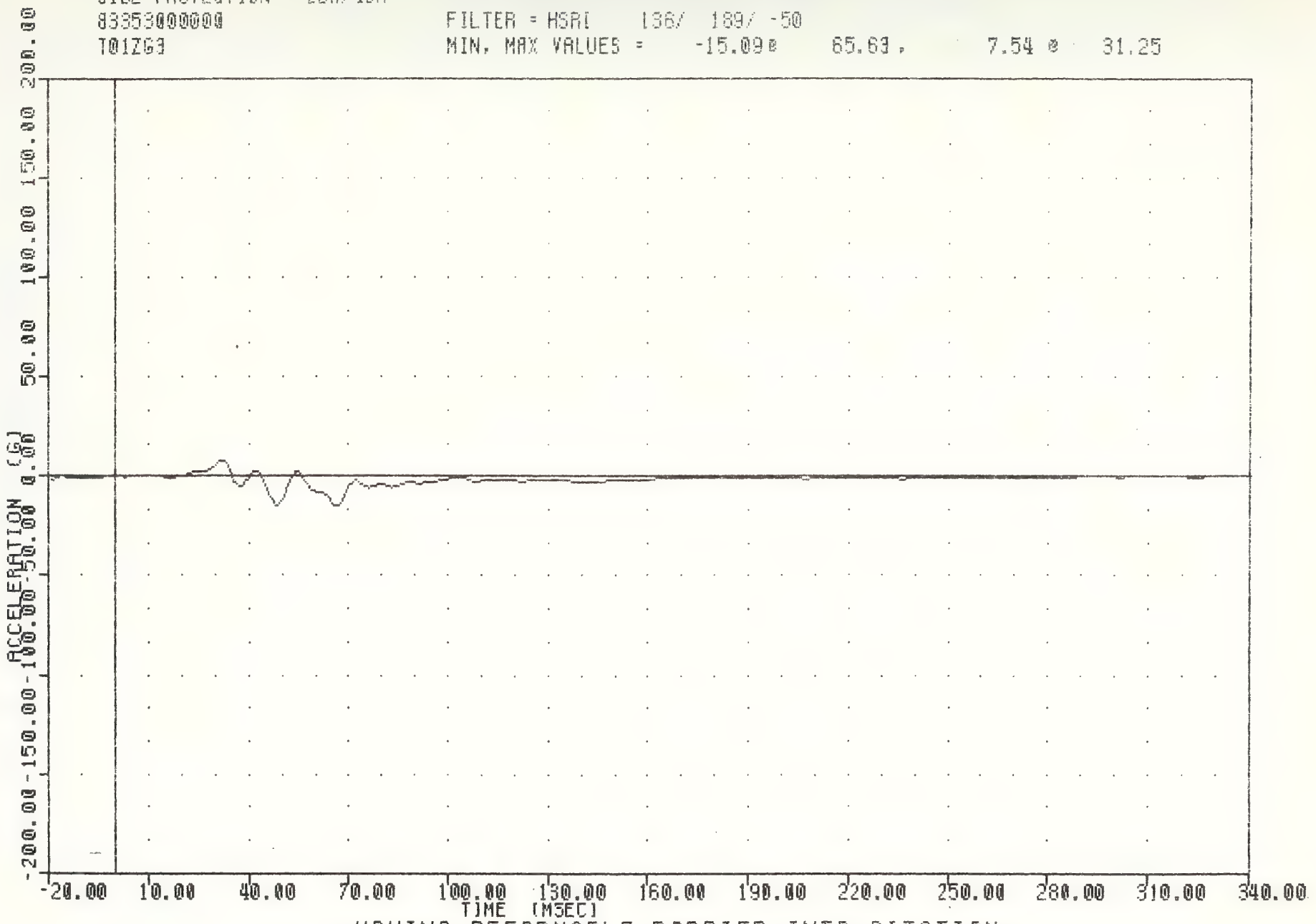
MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER UPPER SPINE ACCELERATION X AXIS



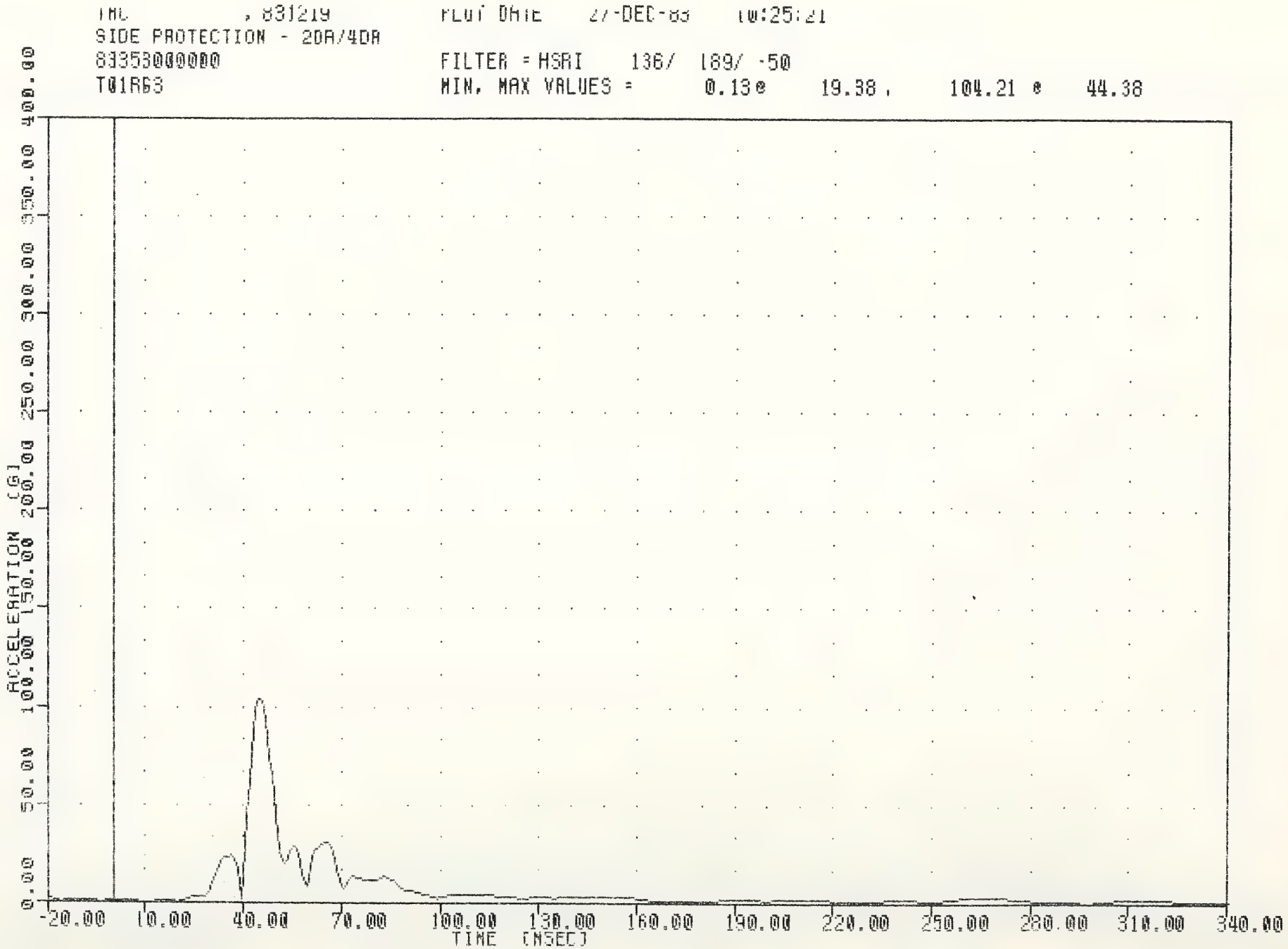
MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER UPPER SPINE ACCELERATION Y AXIS



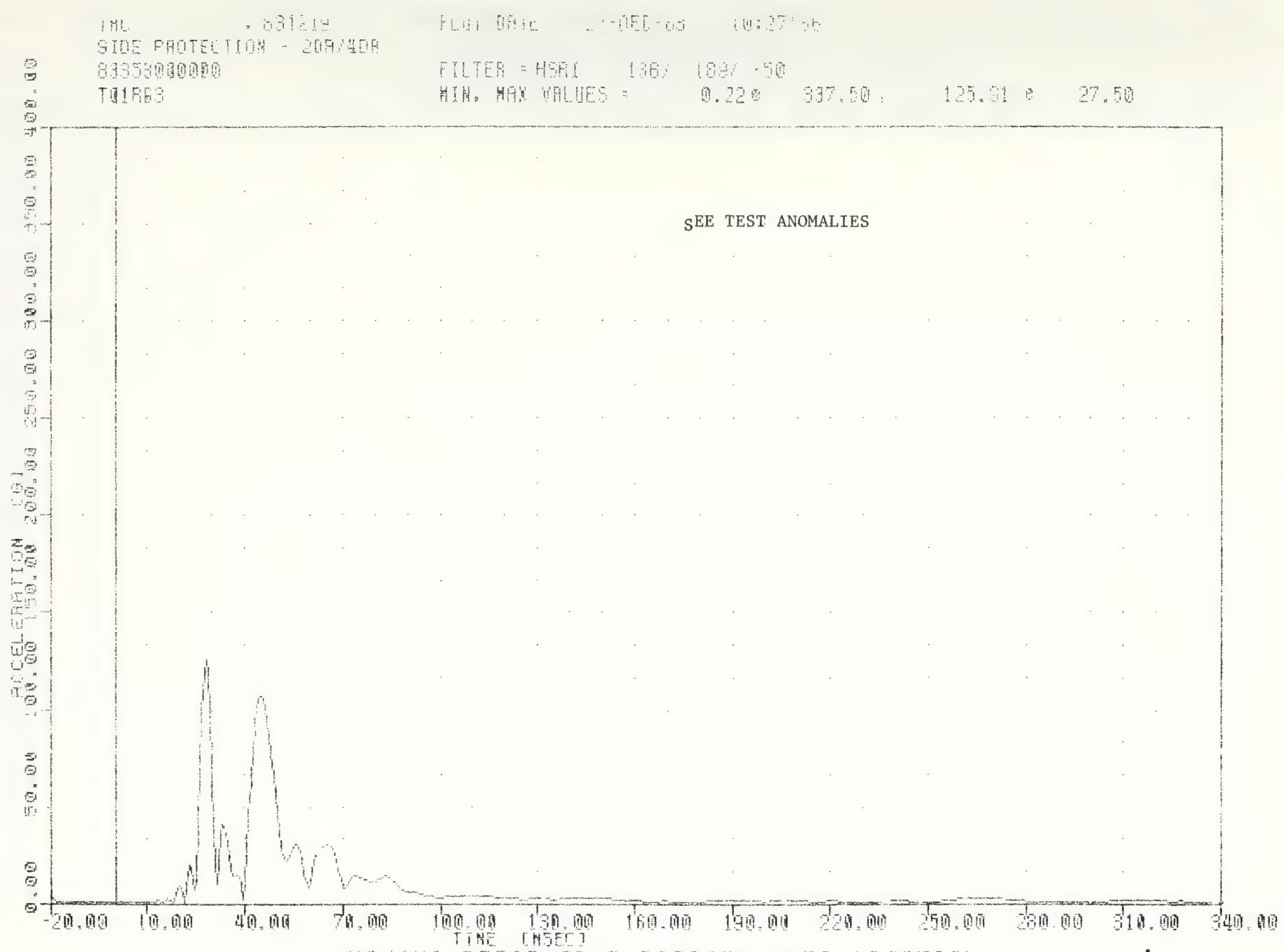
MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER UPPER SPINE ACCELERATION -Z Y AXIS



MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER UPPER SPINE ACCELERATION Z AXIS

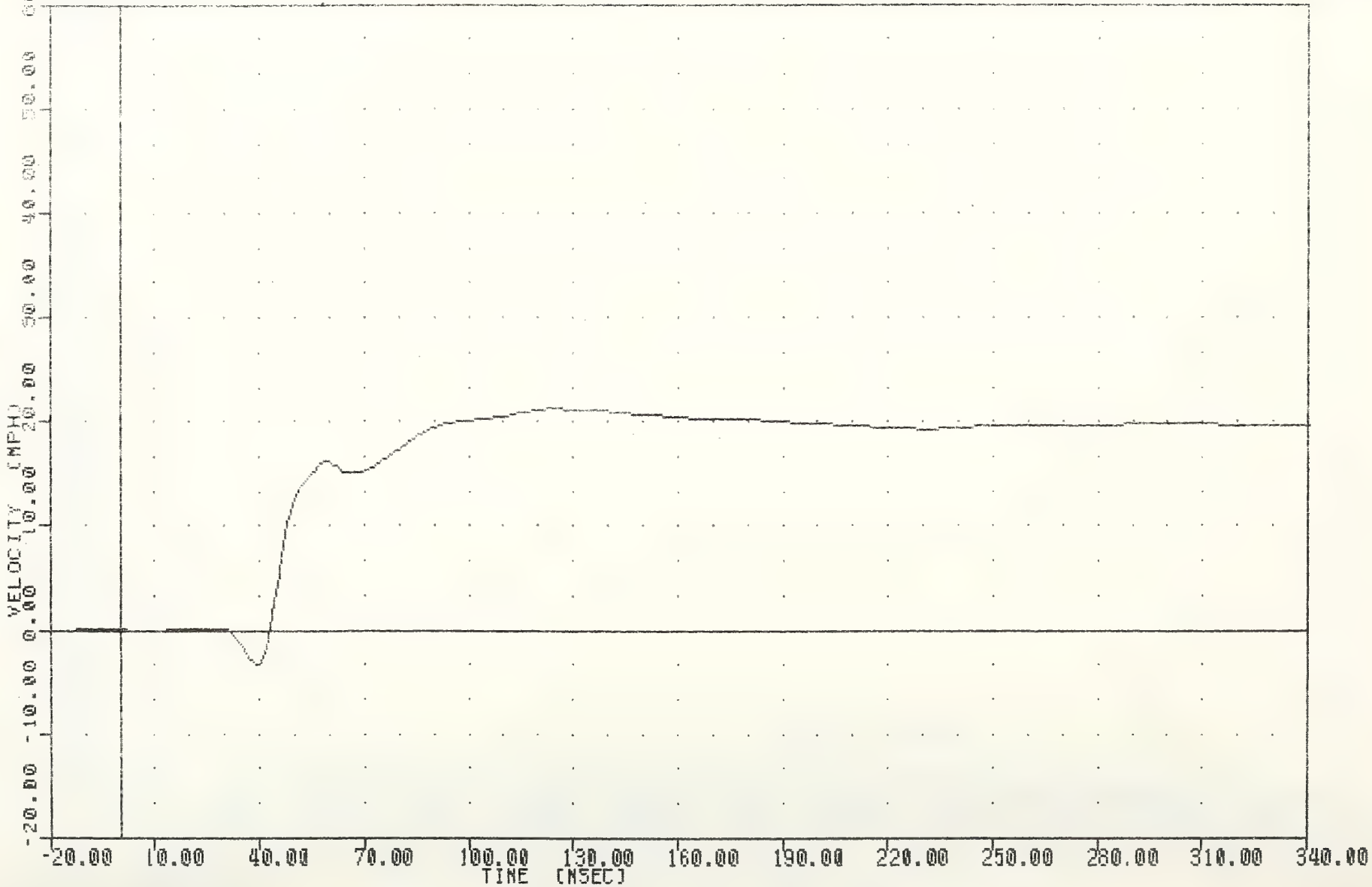


MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER UPPER SPINE RESULTANT



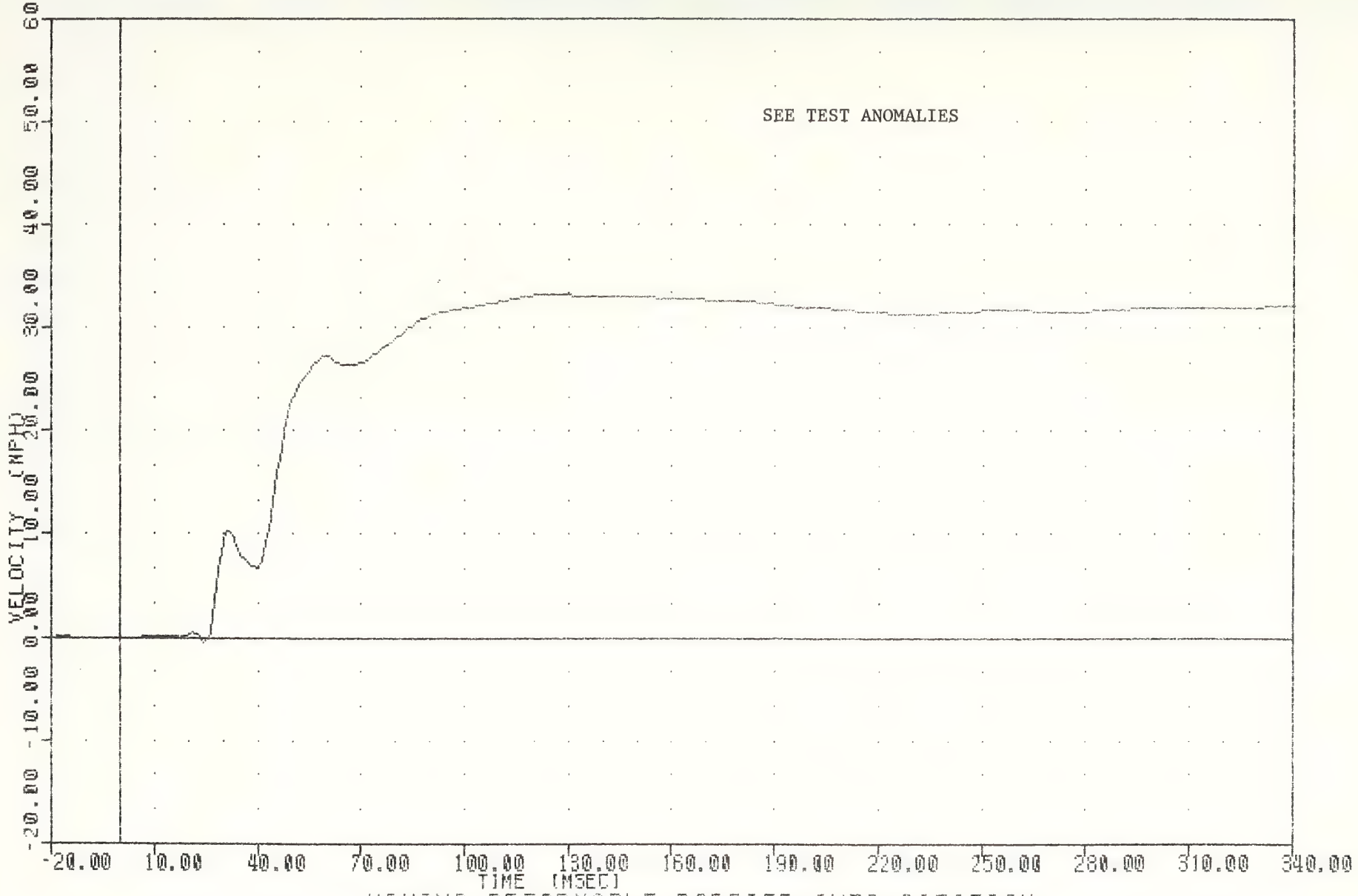
MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER UPPER SPINE RESULTANT USING T01V6C

IHC . 831019 PLOT DATE 07-DEC-83 12:59:34
SIDE PROTECTION - 20DR/40DR
8335300@000 FILTER = H3RI 136/ 189/ 50
T@1YY3 MIN, MAX VALUES = -3.33@ 38.75 , 21.26 @ 124.38

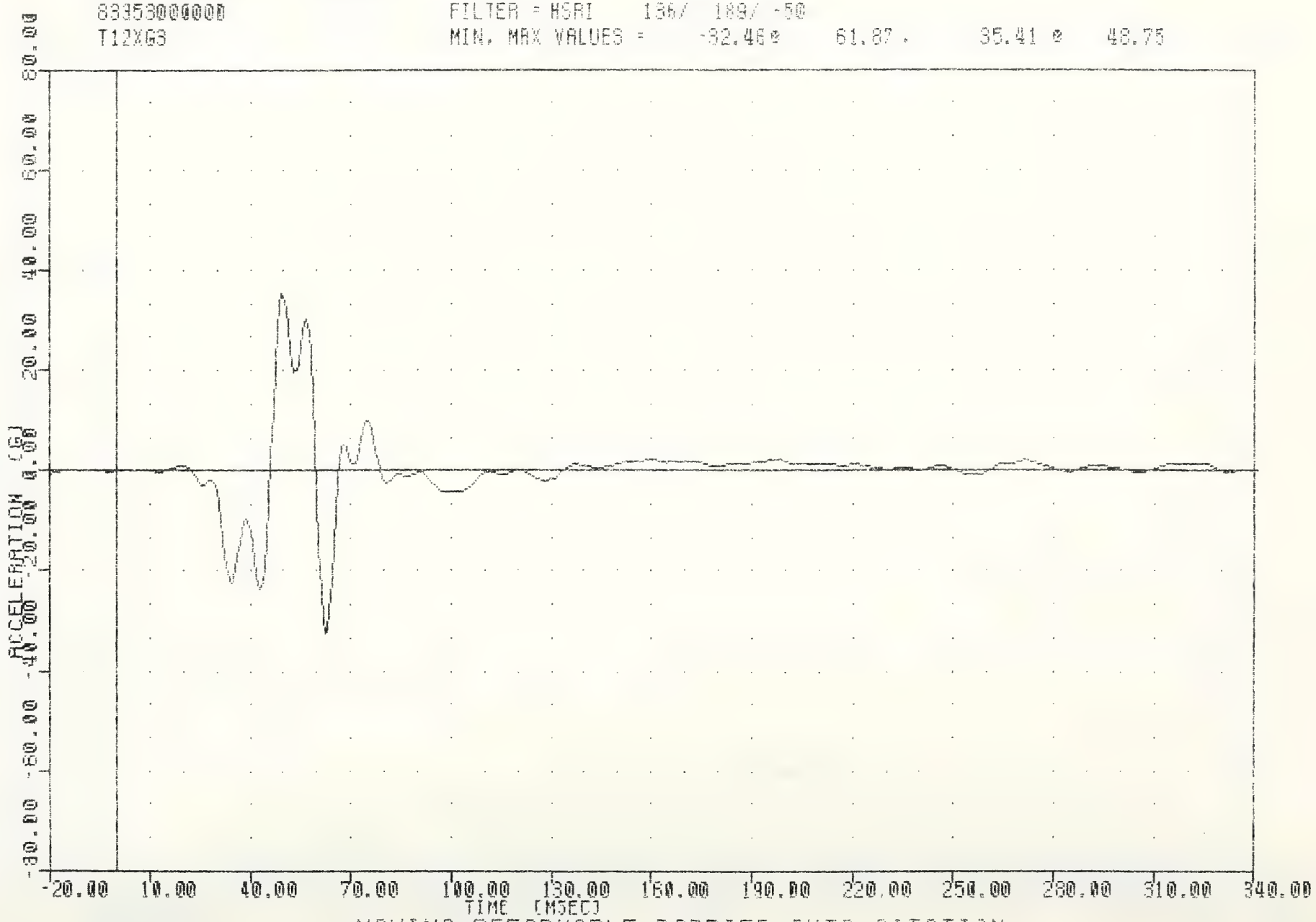


MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING T@1YG3

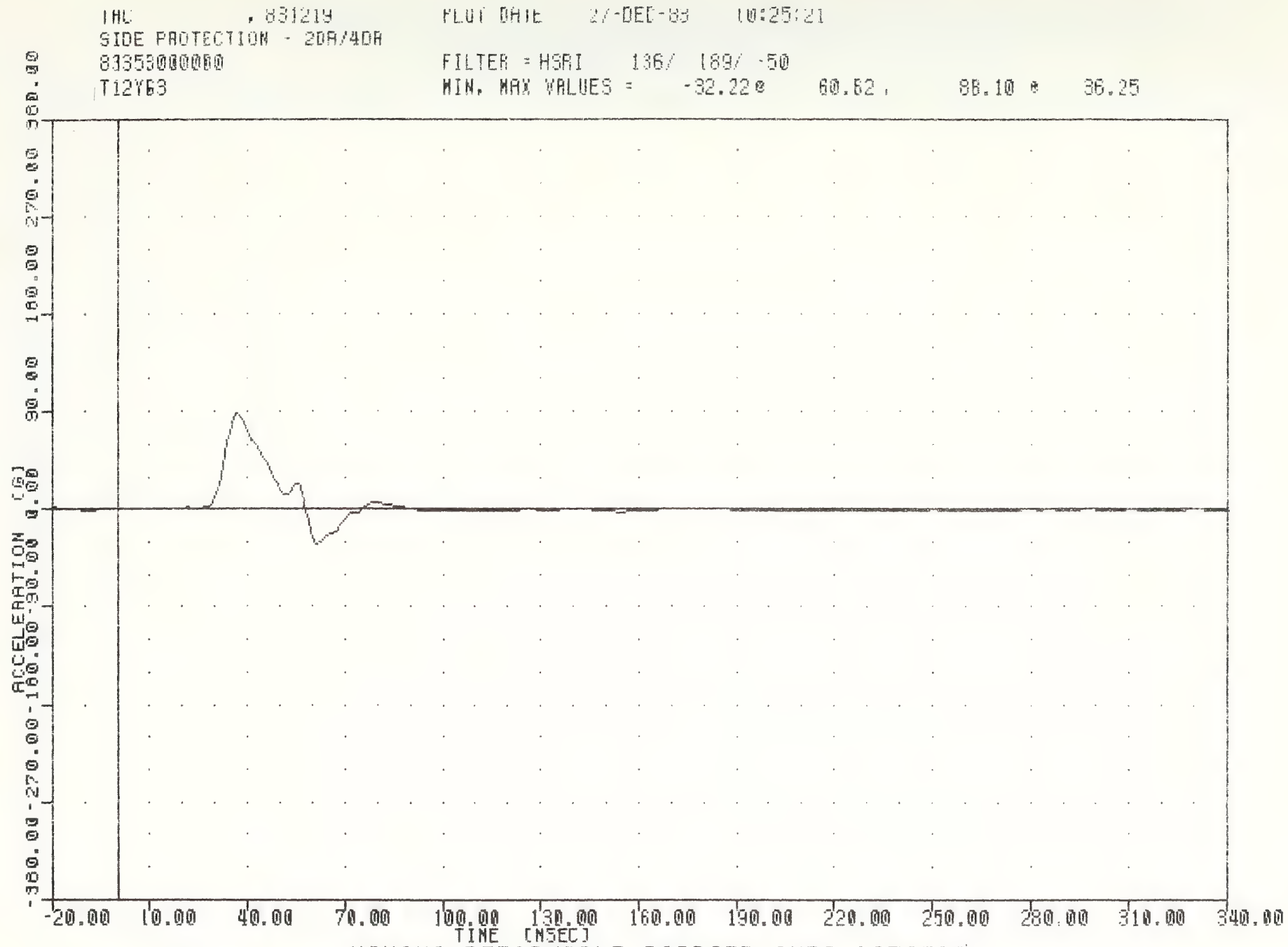
TRC , 831219 PLOT DATE 27-DEC-83 12:58:34
SIDE PROTECTION - 2DR/4DR
83353000000 FILTER = HSRI 136/ 189/ -50
T01YVC MIN. MAX VALUES = -0.44 @ 23.75 , 33.26 @ 124.38



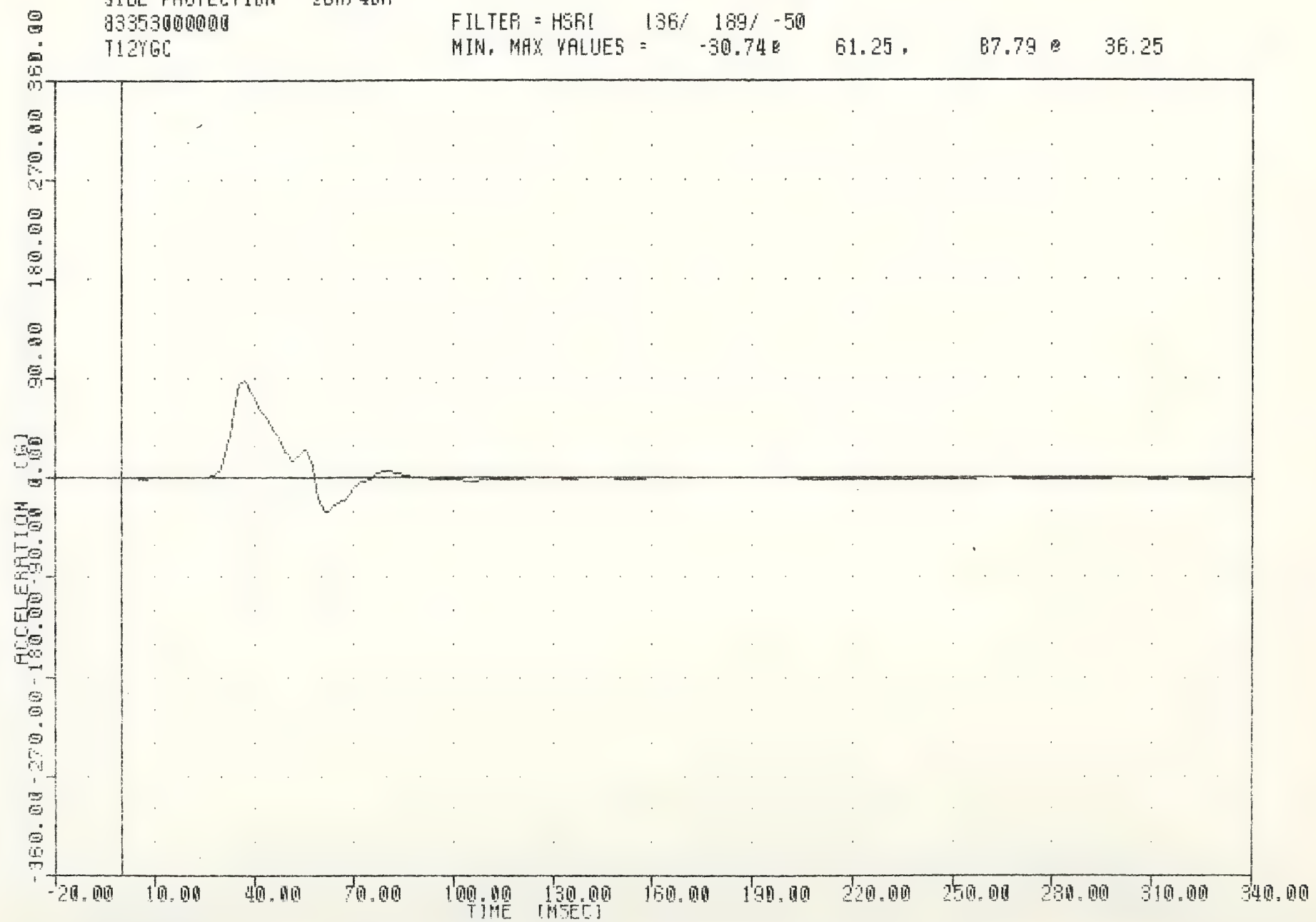
MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING T01YSC



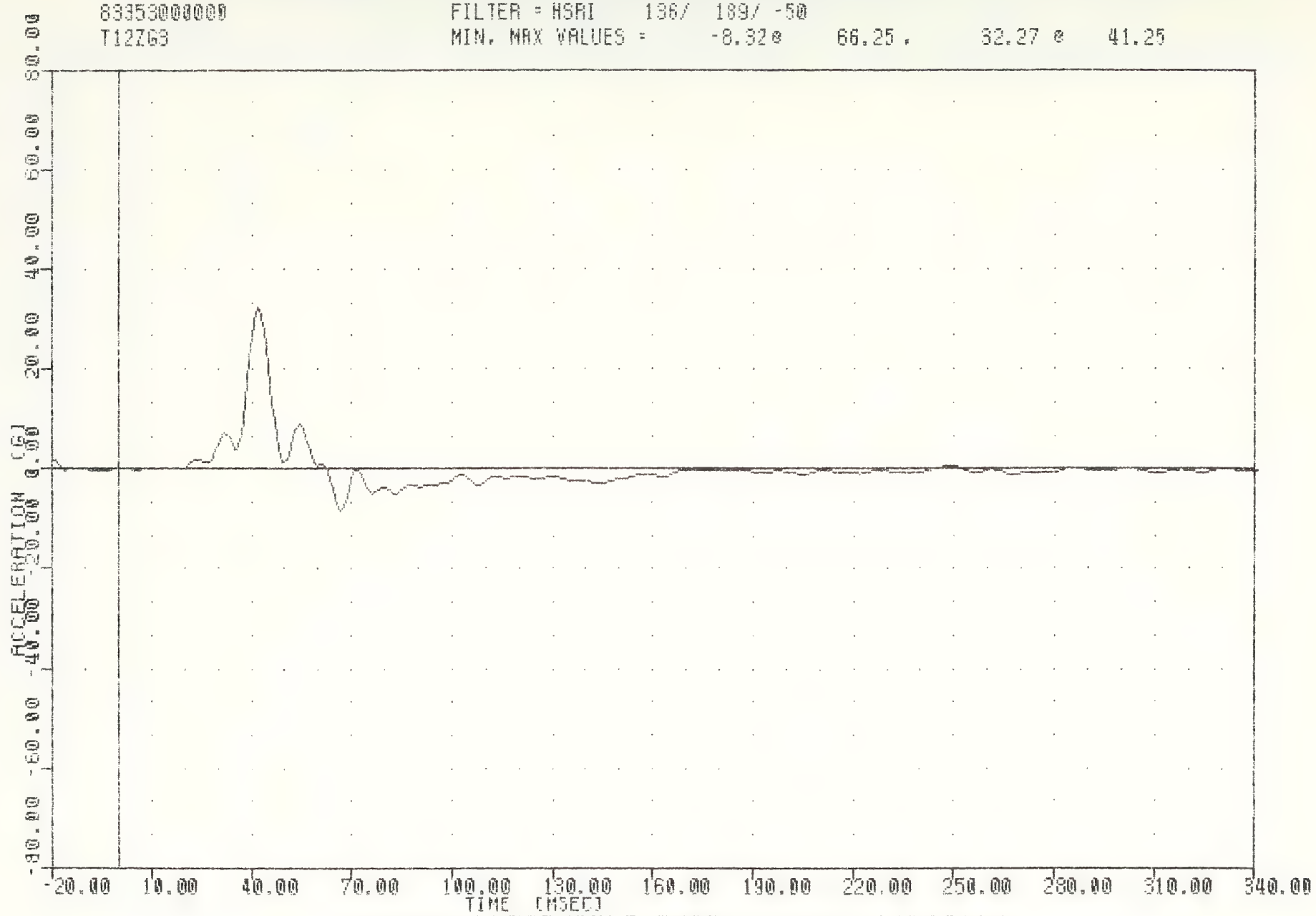
MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER LOWER SPINE ACCELERATION X AXIS



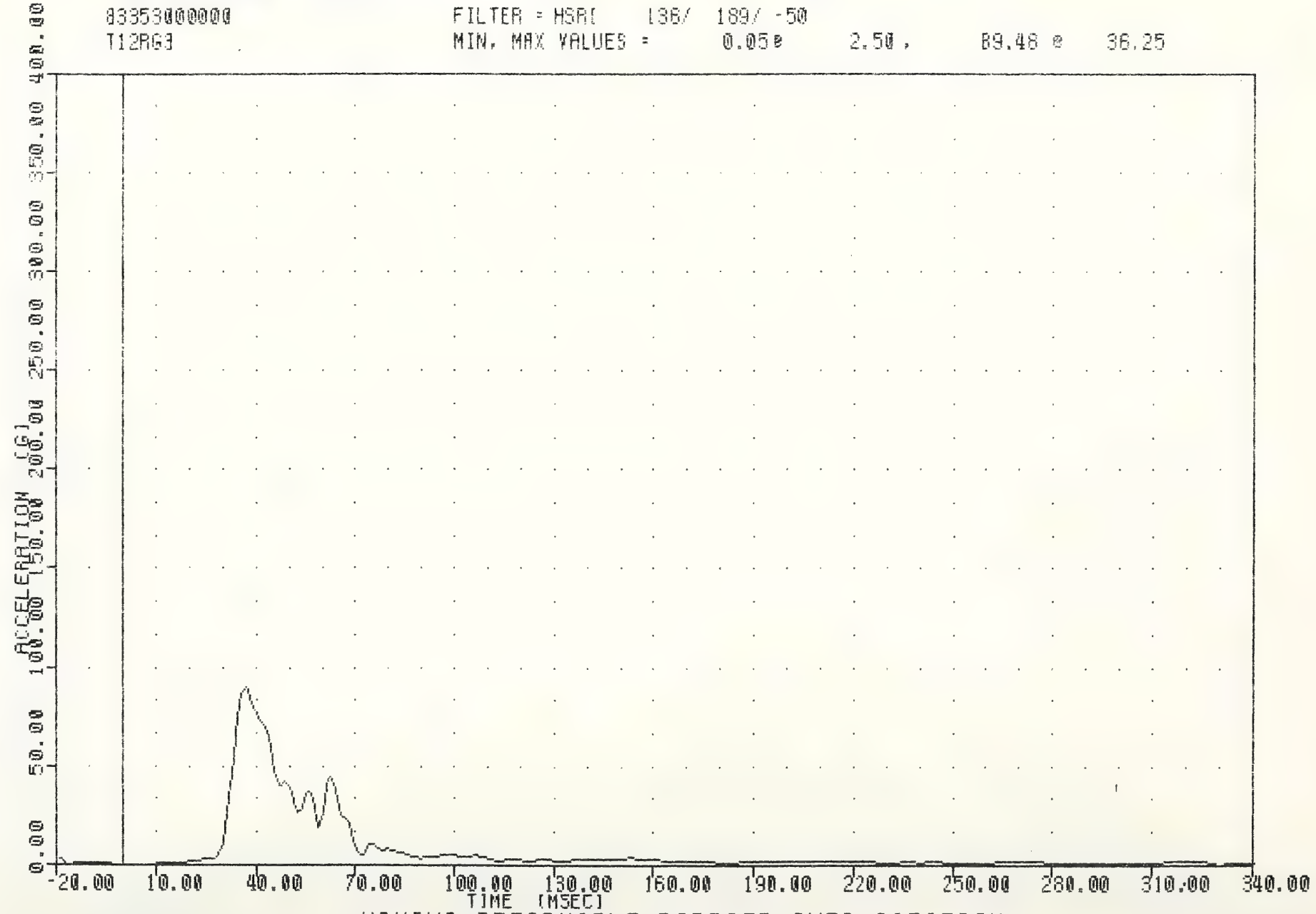
MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER LOWER SPINE ACCELERATION Y AXIS



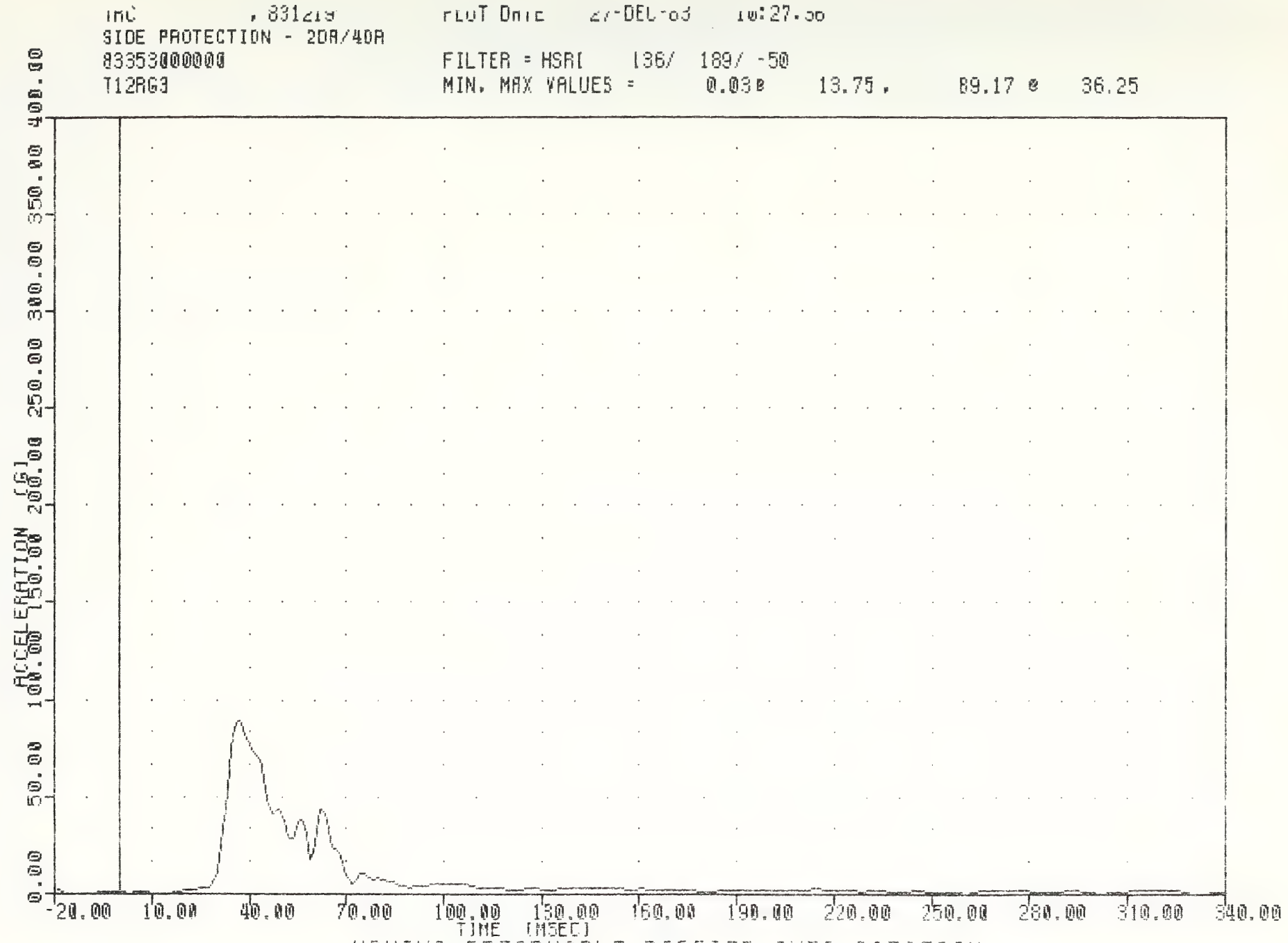
MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER LOWER SPINE ACCELERATION -2 Y AXIS

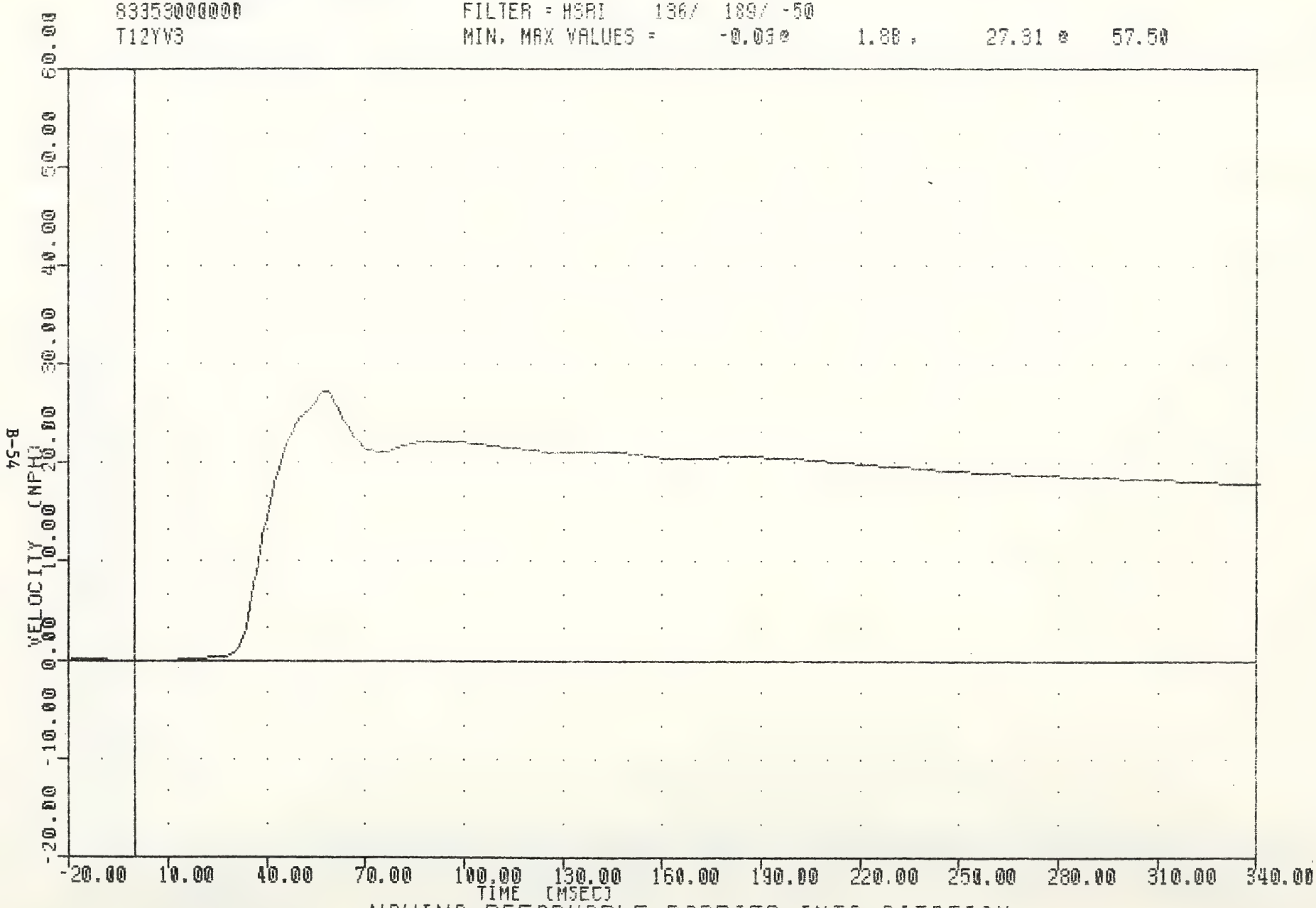


MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER LOWER SPINE ACCELERATION Z AXIS

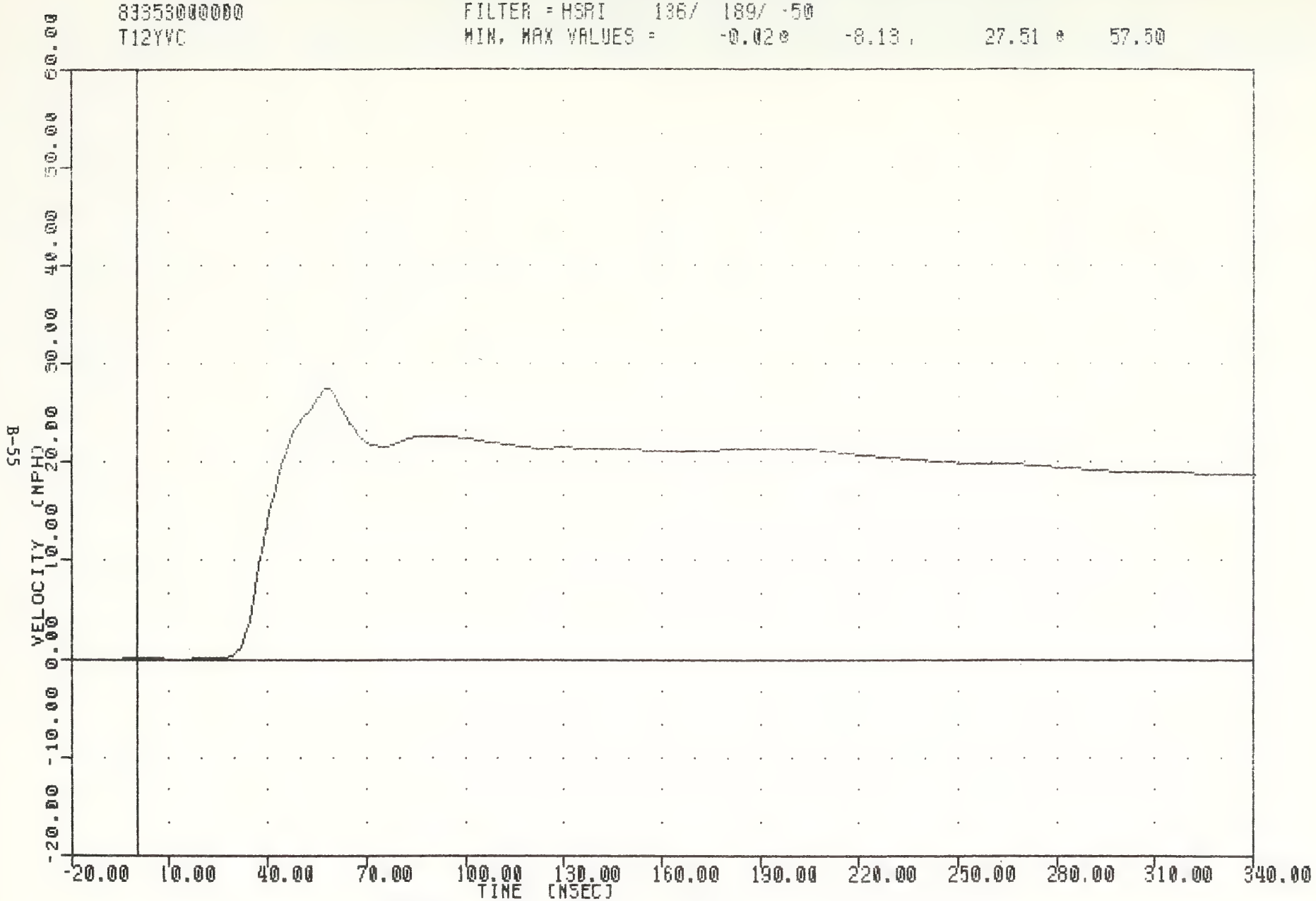


MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER LOWER SPINE RESULTANT

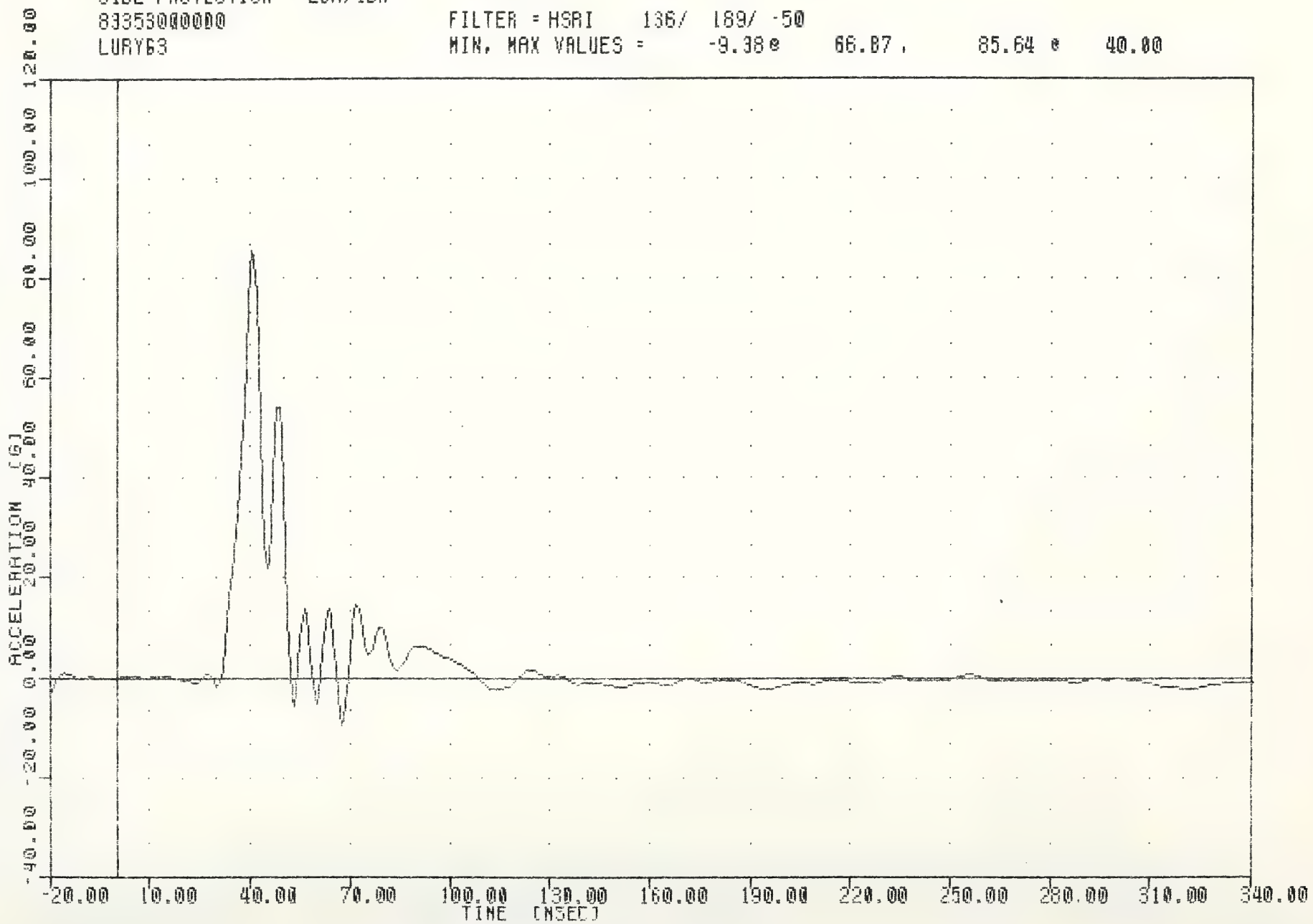

INC , 831219 PLOT DATE 27-DEC-83 10:27.00
SIDE PROTECTION - 20A/40A
83353000000
T12RG3
FILTER = HSRI 136/ 189/ -50
MIN, MAX VALUES = 0.030 13.75 , 89.17 @ 36.25
ACCELERATION (G)
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER LOWER SPINE RESULTANT USING T12YGC



MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING T12YG3

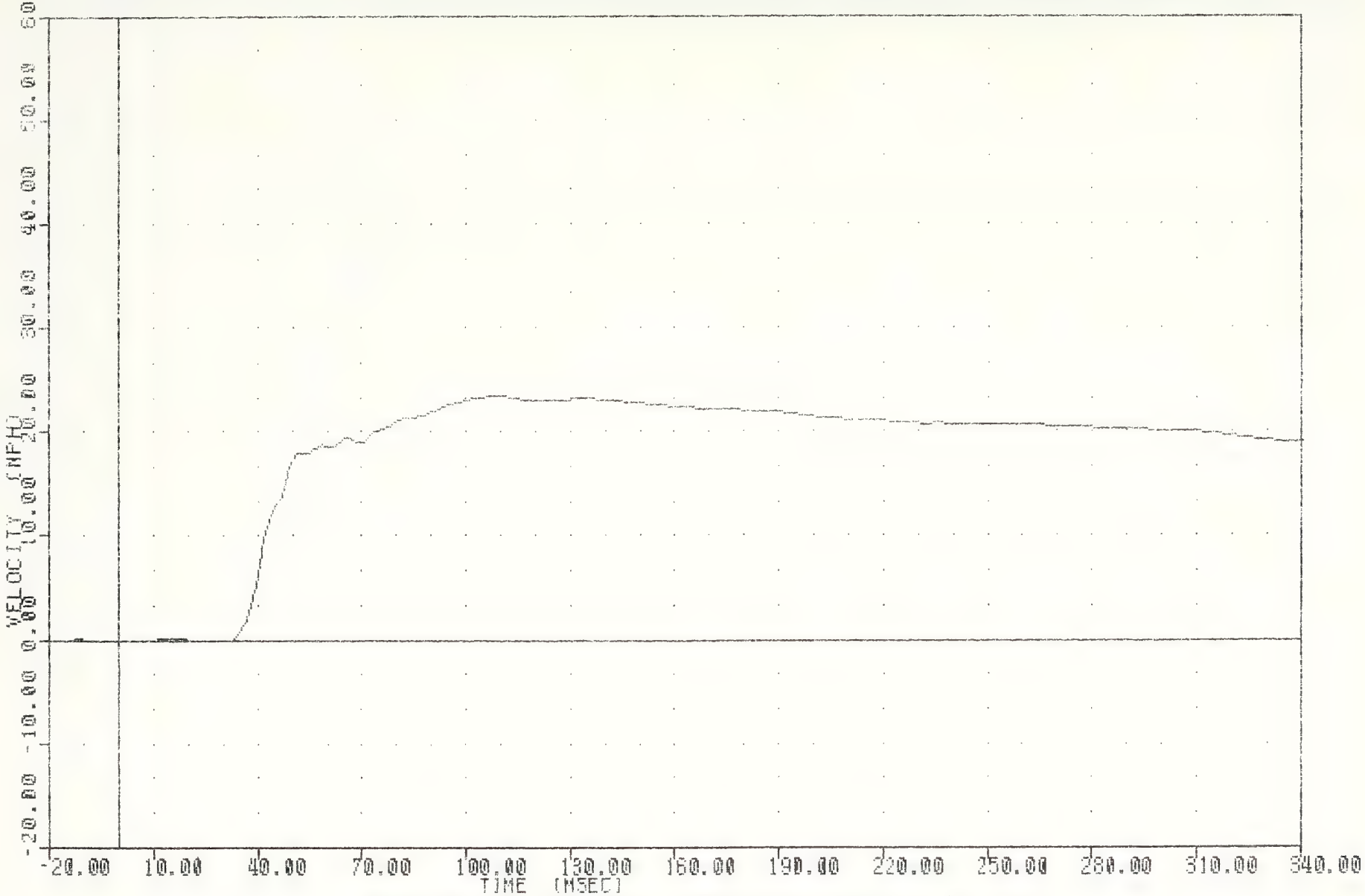


MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING T12YGC

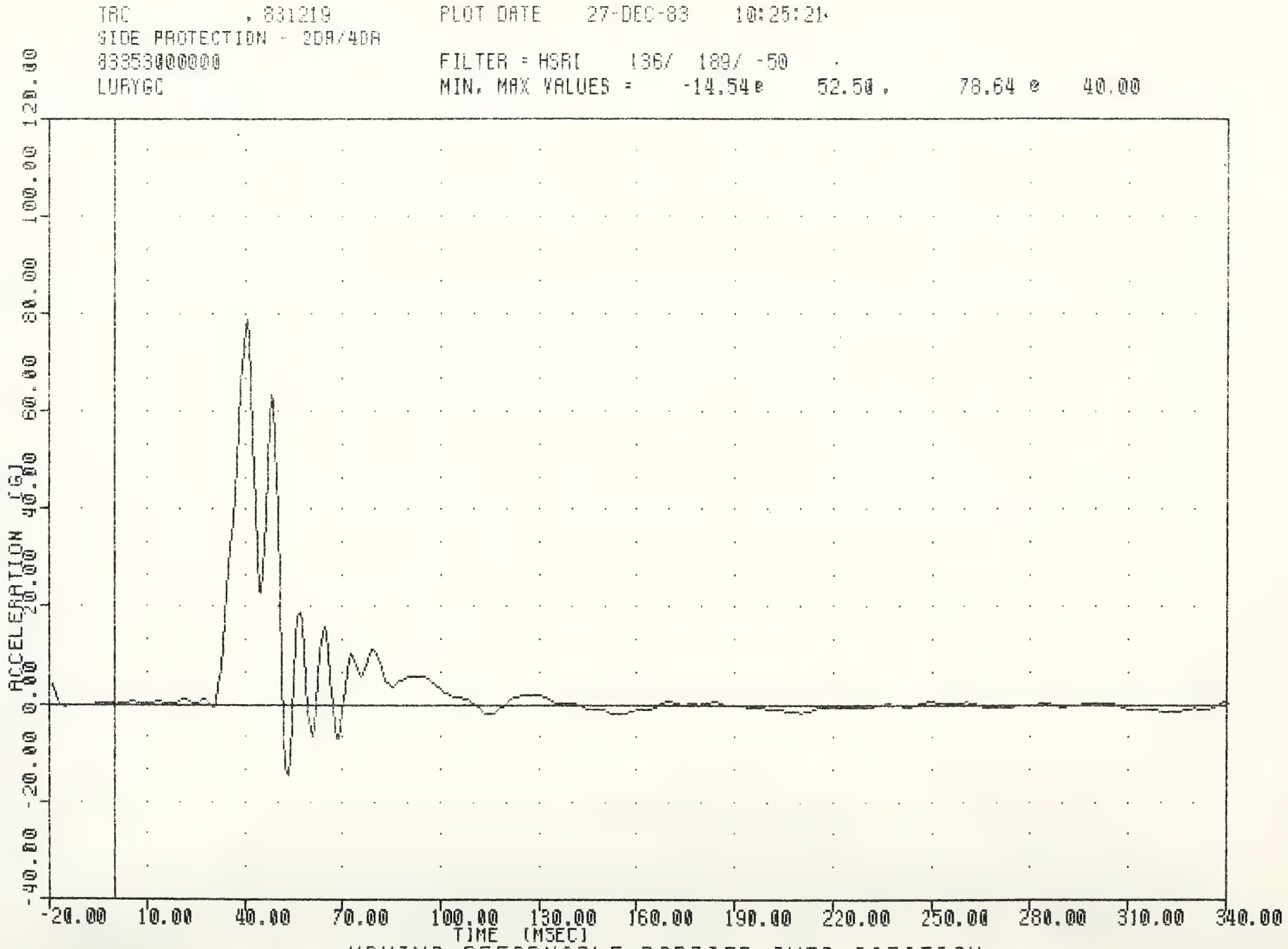


MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER LEFT UPPER RIB ACCELERATION Y AXIS

IRC . 891219 PLOT DATE 27-DEC-89 12:58:30
SIDE PROTECTION - 20A/40A
8335300000 FILTER = HSRI 136/ 189/ -50
LURTV3 MIN. MAX VALUES = -0.13 @ 30.62 , 23.42 @ 108.13

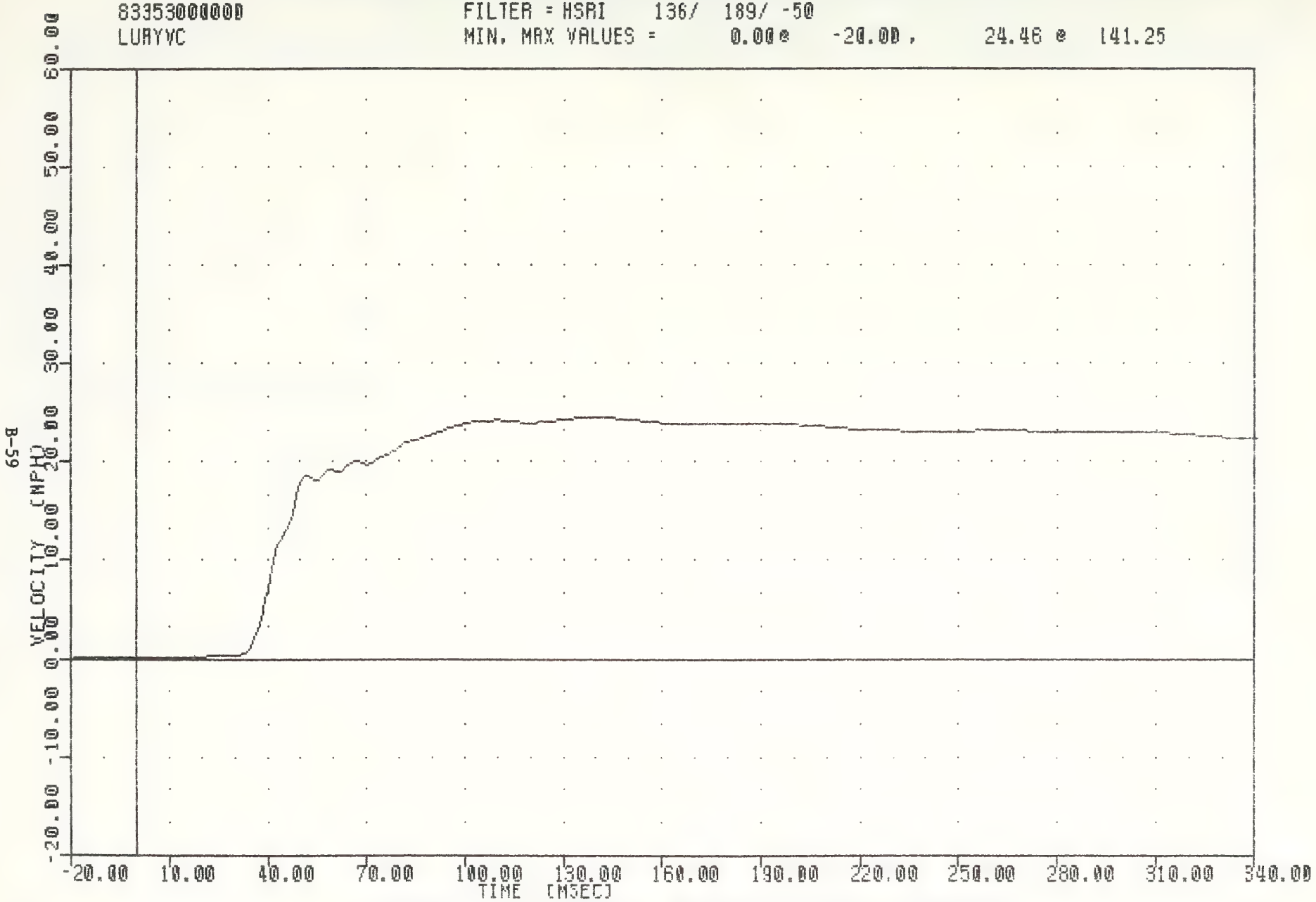


MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING LURYG3

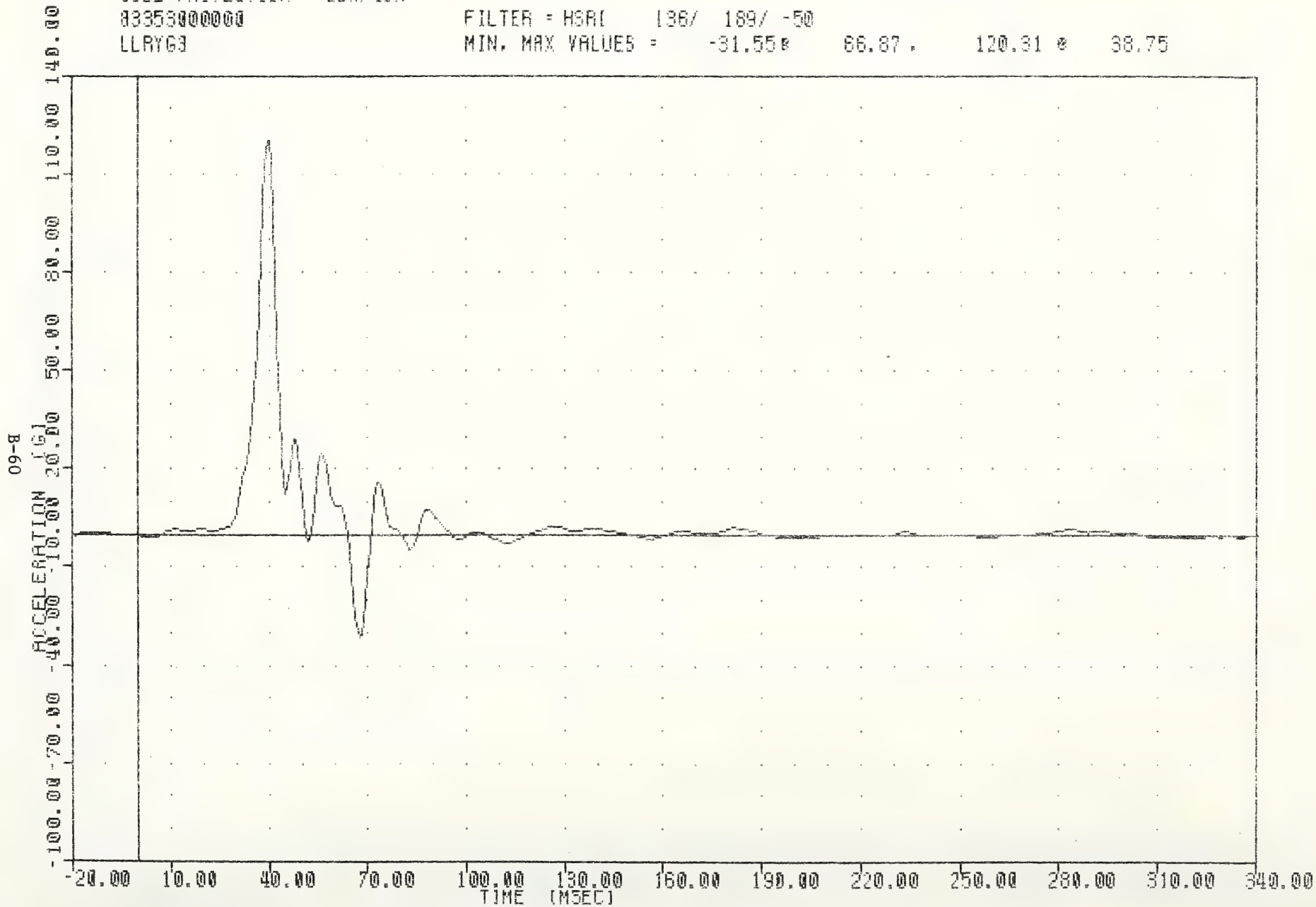


MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER LEFT UPPER RIB ACCELERATION -2 Y AXIS

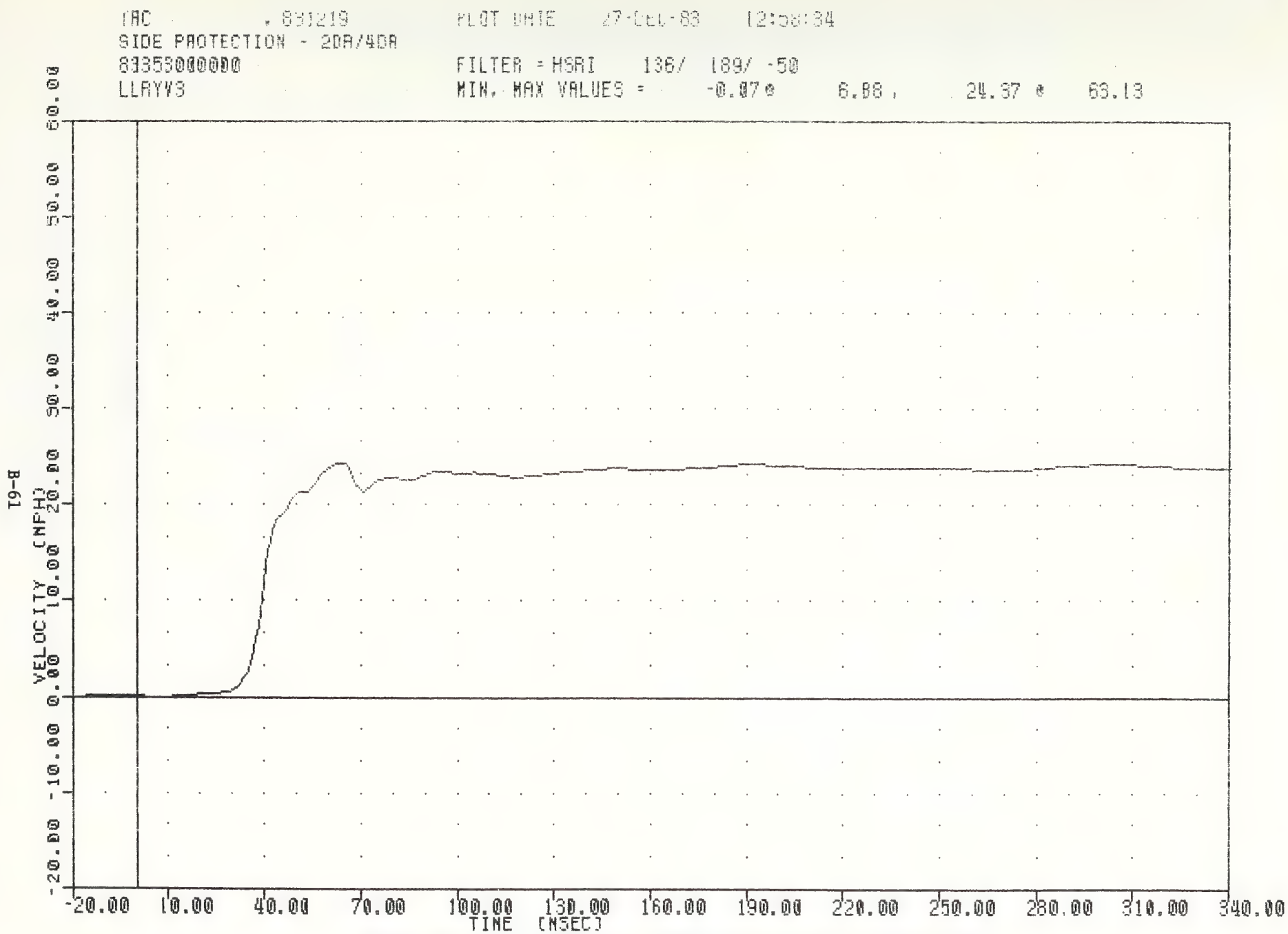
TRC , 831219 PLOT DATE 27-DEC-83 12:58:34
SIDE PROTECTION - 2DR/4DR
8335300000D FILTER = HSRI 136/ 189/ -50
LURYVC MIN, MAX VALUES = 0.00@ -20.00 , 24.46 @ 141.25



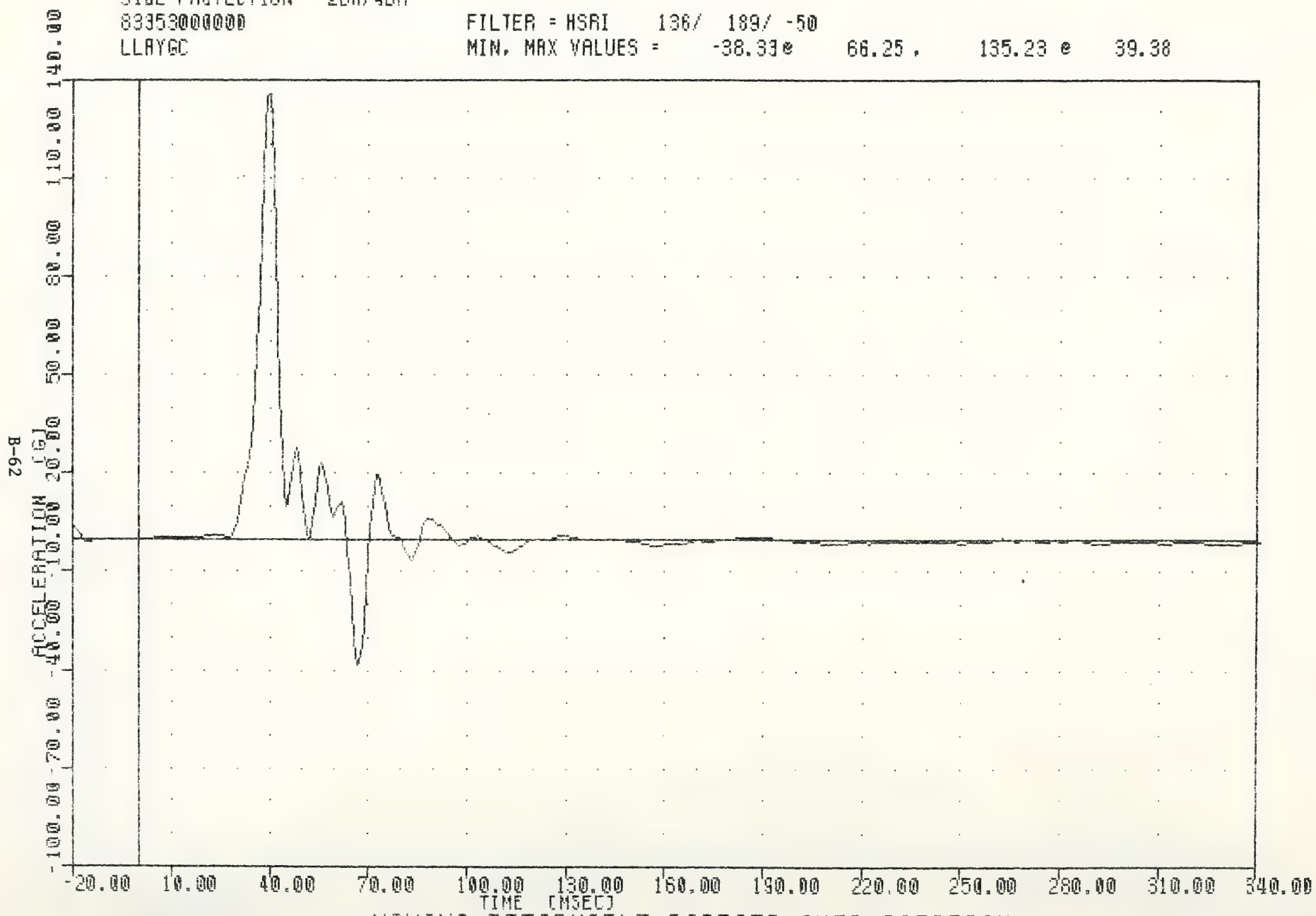
MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING LURYGC



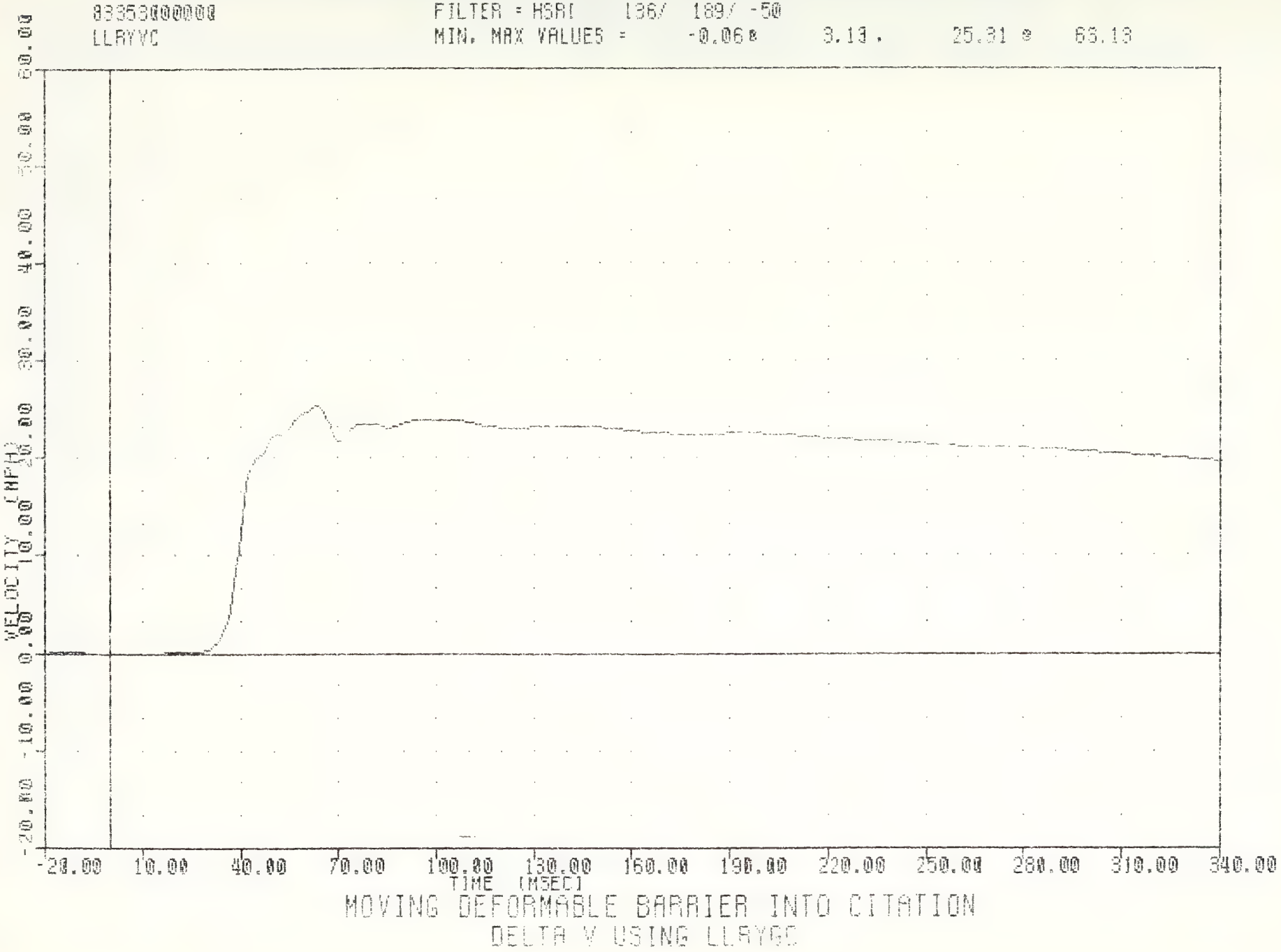
MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER LEFT LOWER RIB ACCELERATION Y AXIS

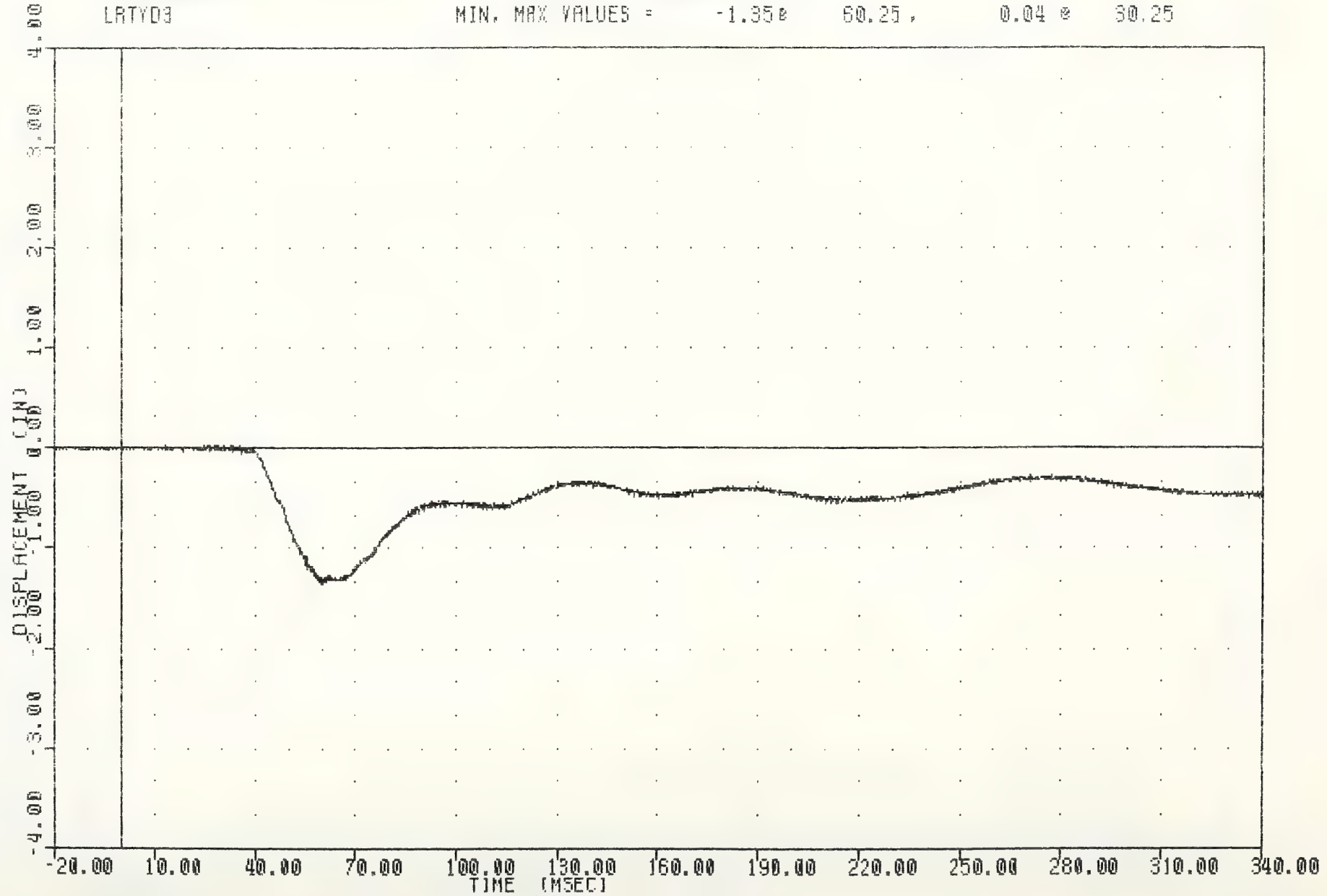


MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING LLRYG3

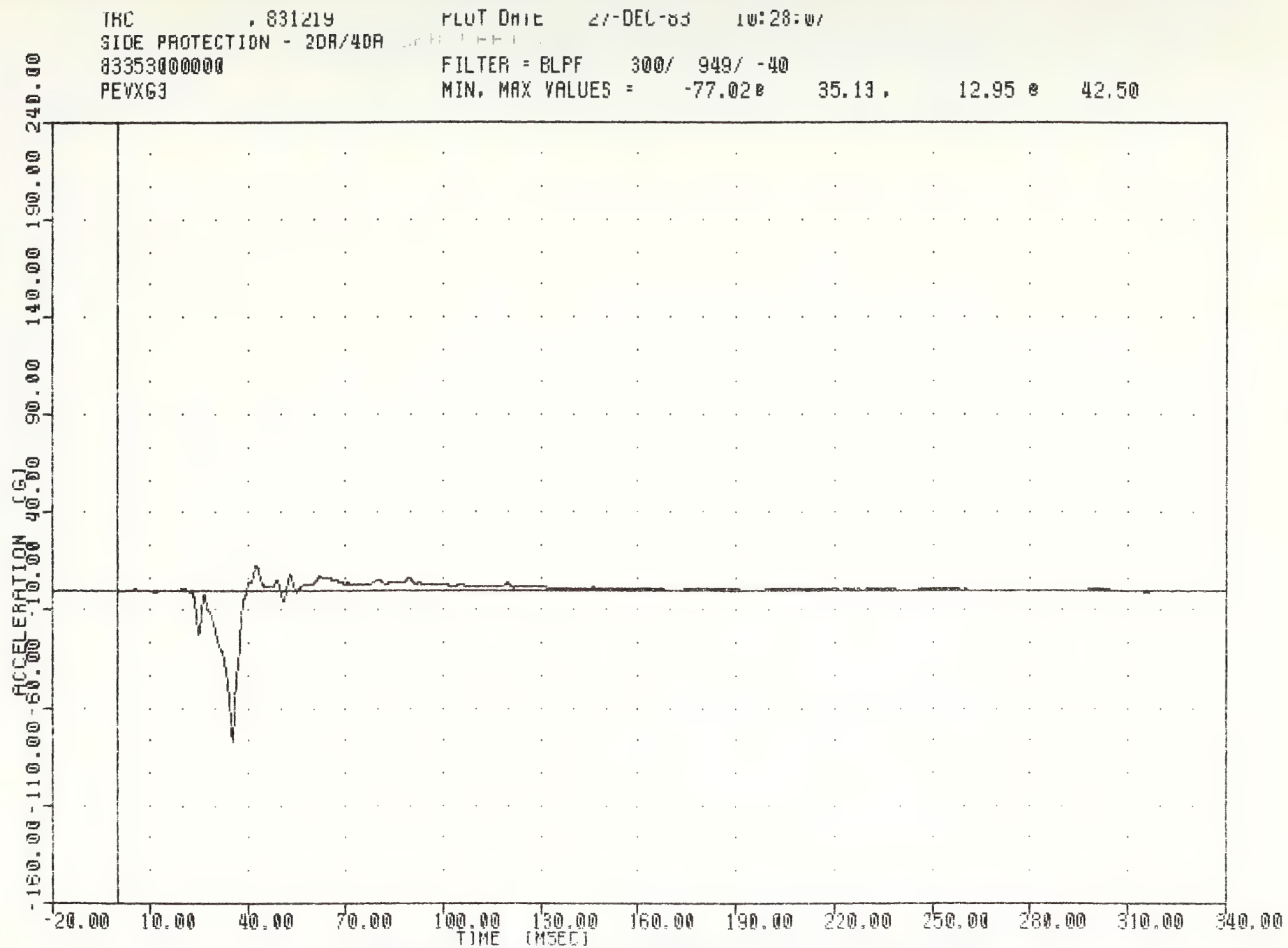


MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER LEFT LOWER RIB ACCELERATION #2 Y AXIS

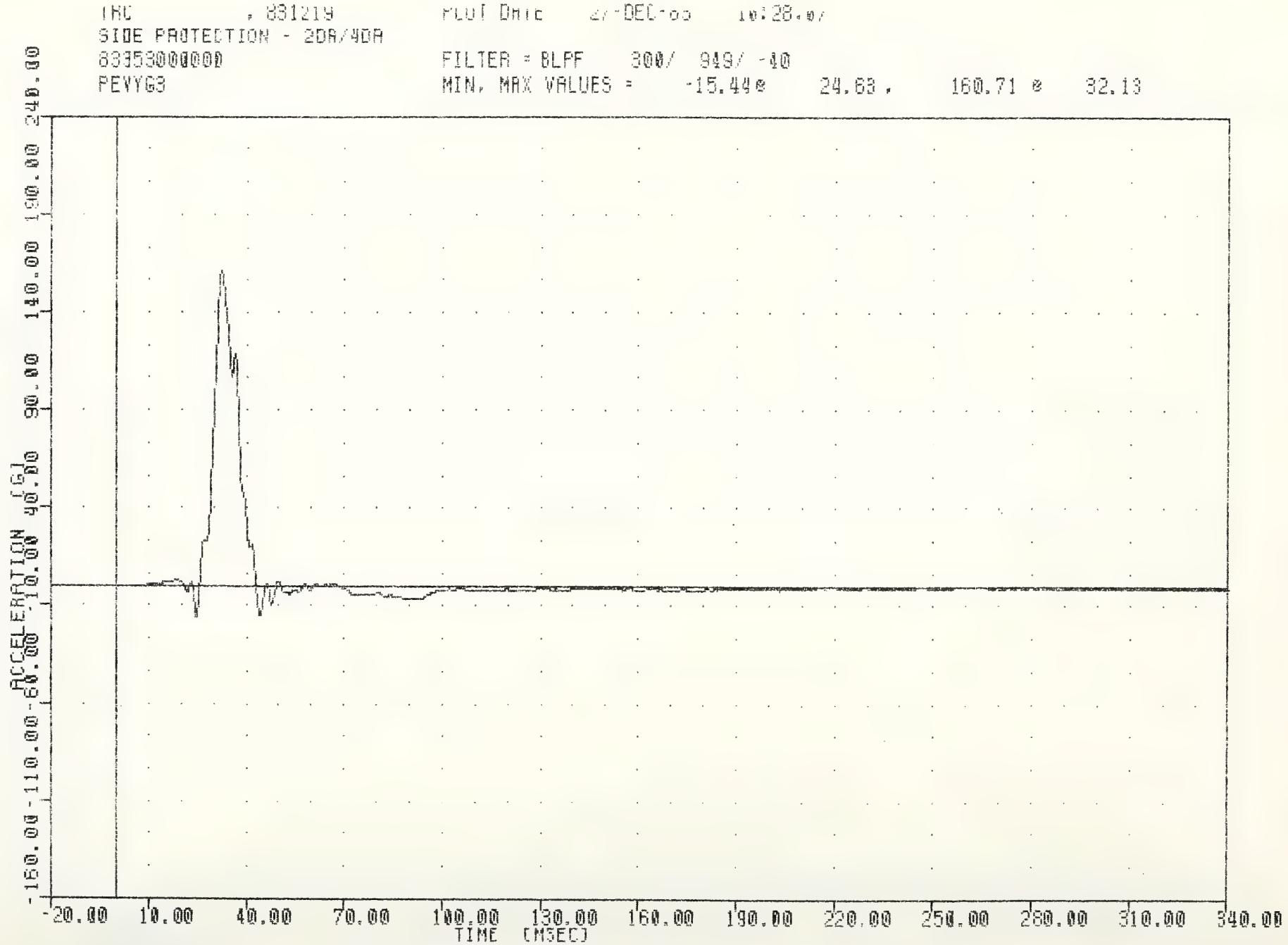

TRC . 831219
PLOT DATE 27-DEC-83 12:56:34
SIDE PROTECTION - 20R/40R
83353@@@@@@
FILTER = HSAE 136/ 189/ -50
LLAYYC
MIN. MAX VALUES = -0.06 @ 3.13 . 25.31 @ 66.13
VELOCITY (MPH)
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING LLAYGC



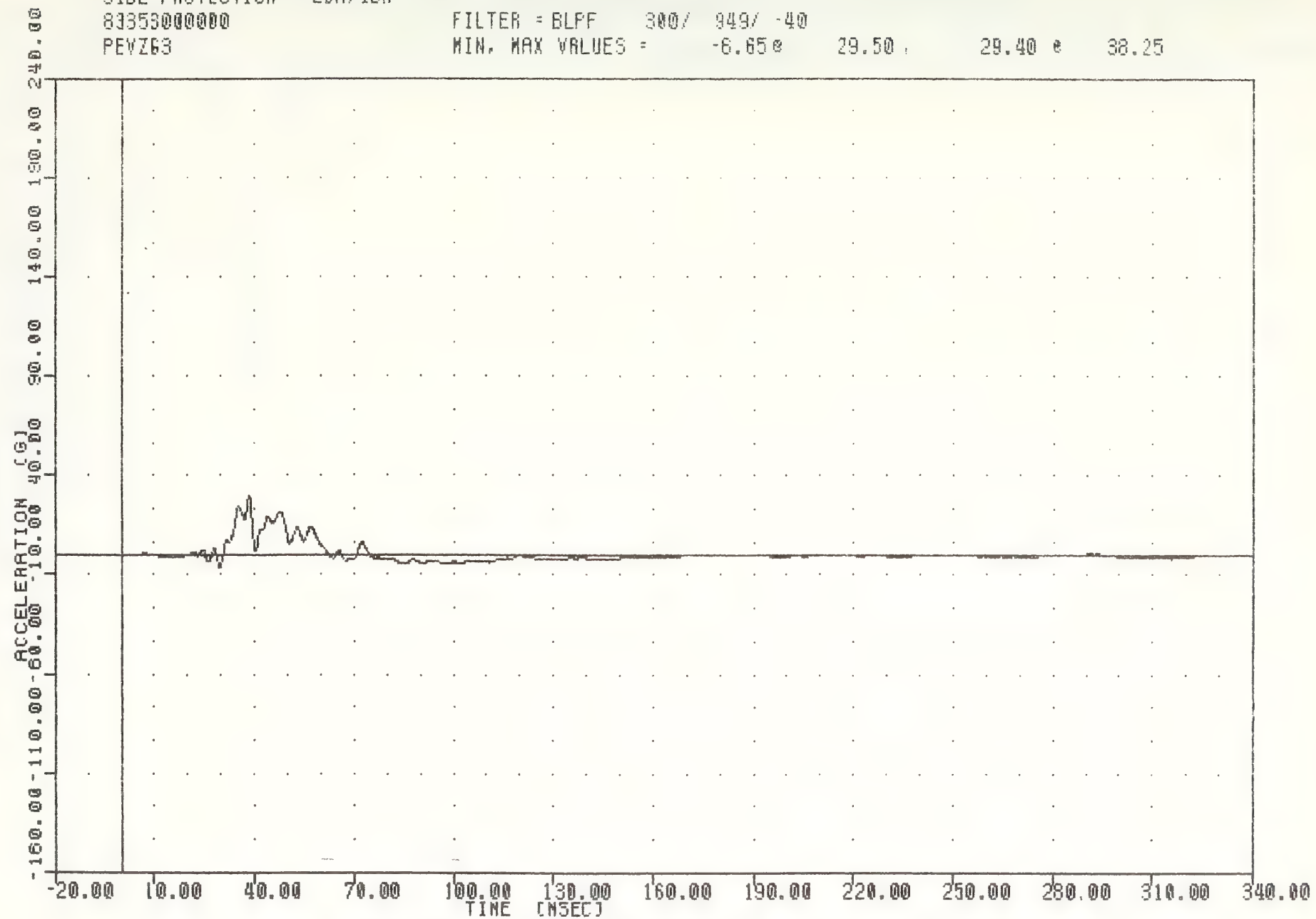
MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER LEFT RIB TO SPINE DISPLACEMENT INCHES



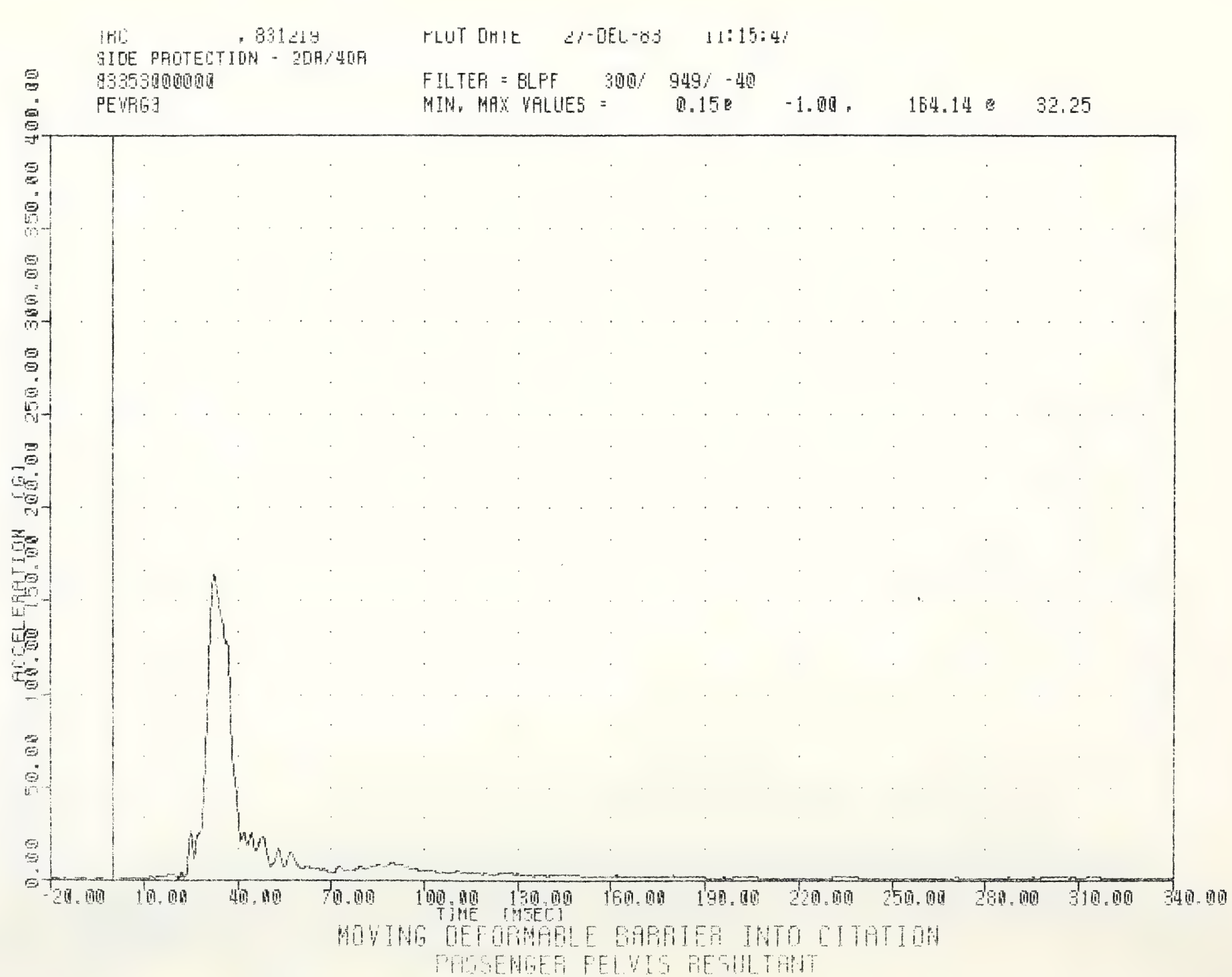
MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER PELVIS ACCELERATION X AXIS

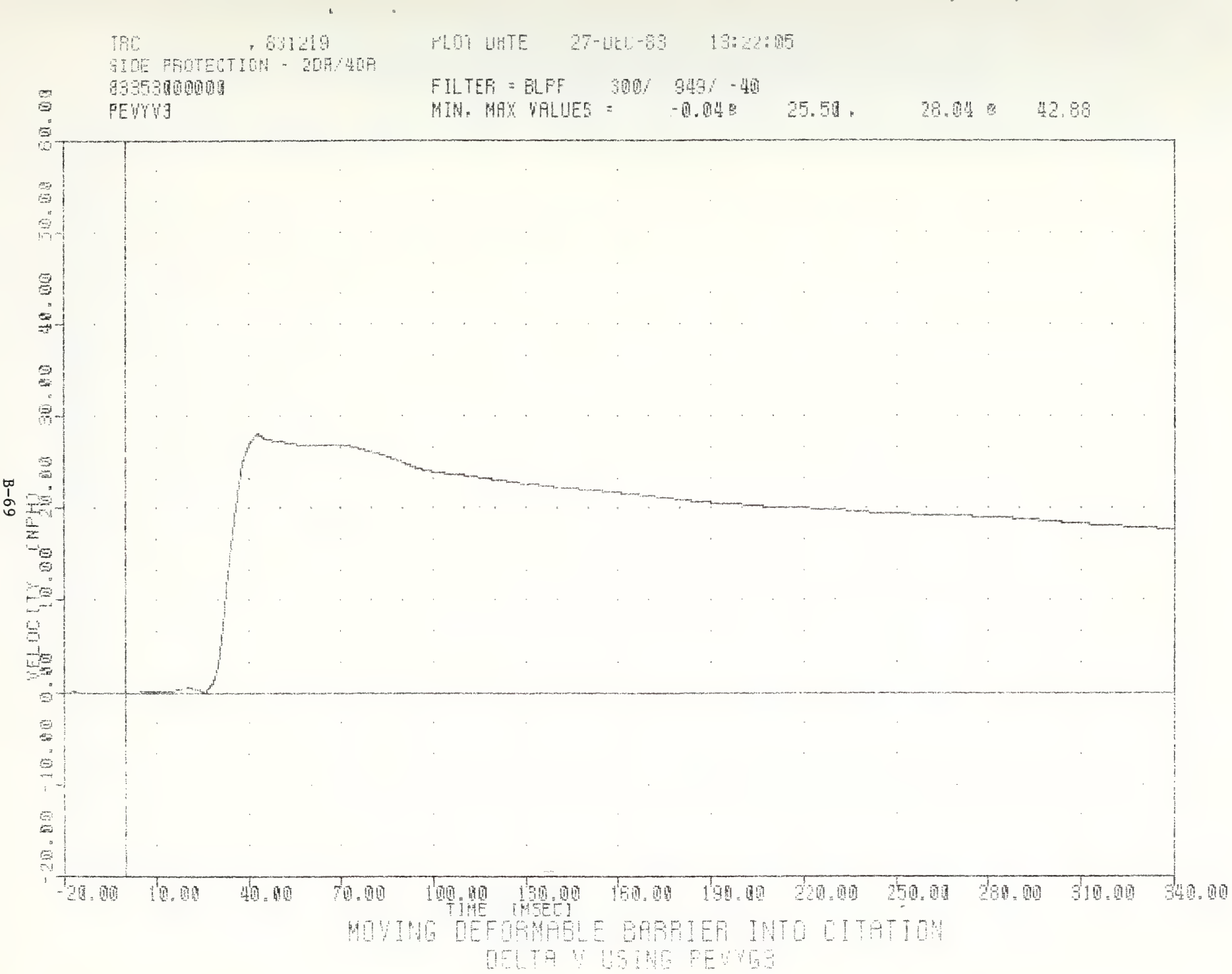


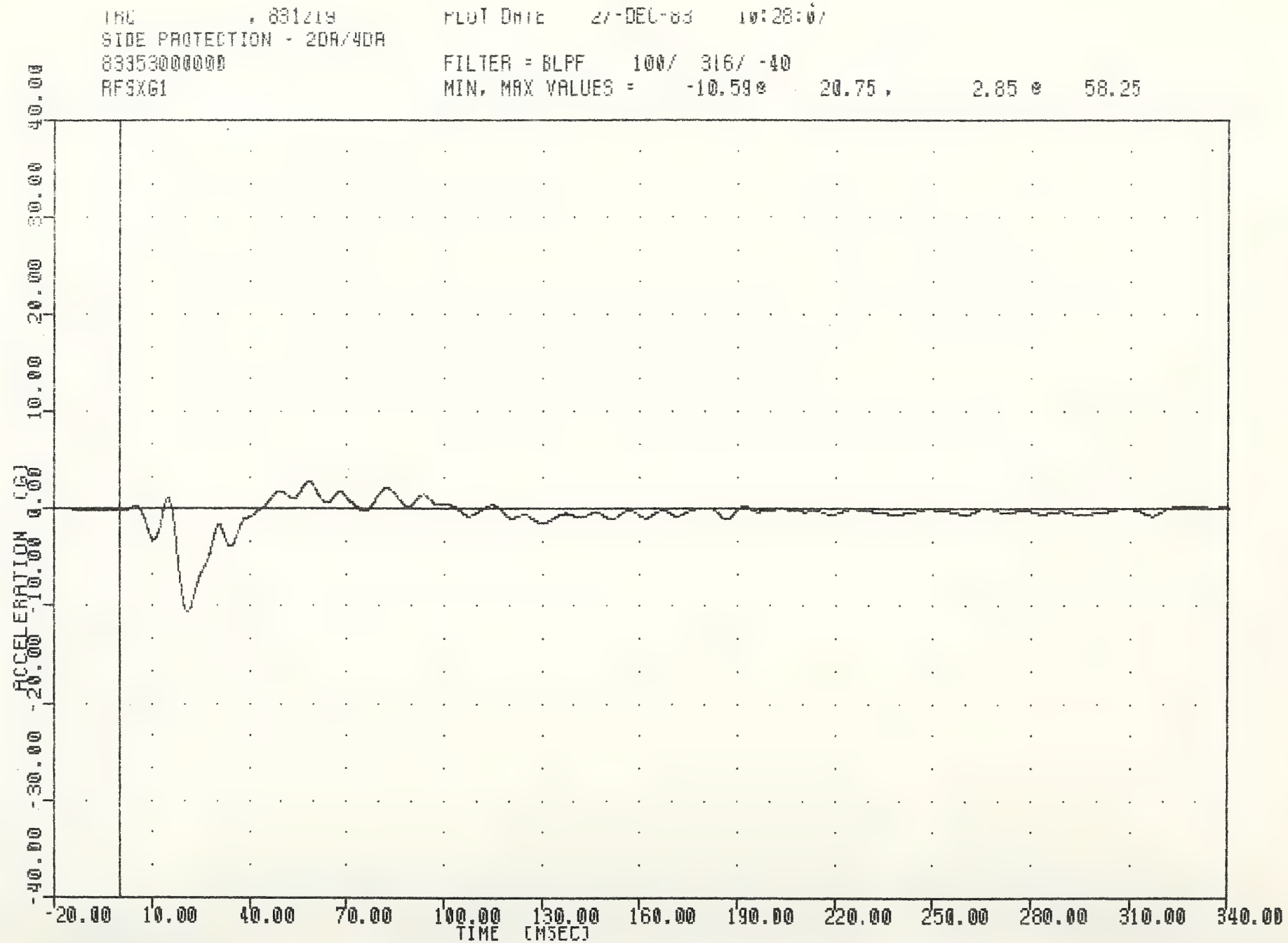
MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER PELVIS ACCLERATION Y AXIS



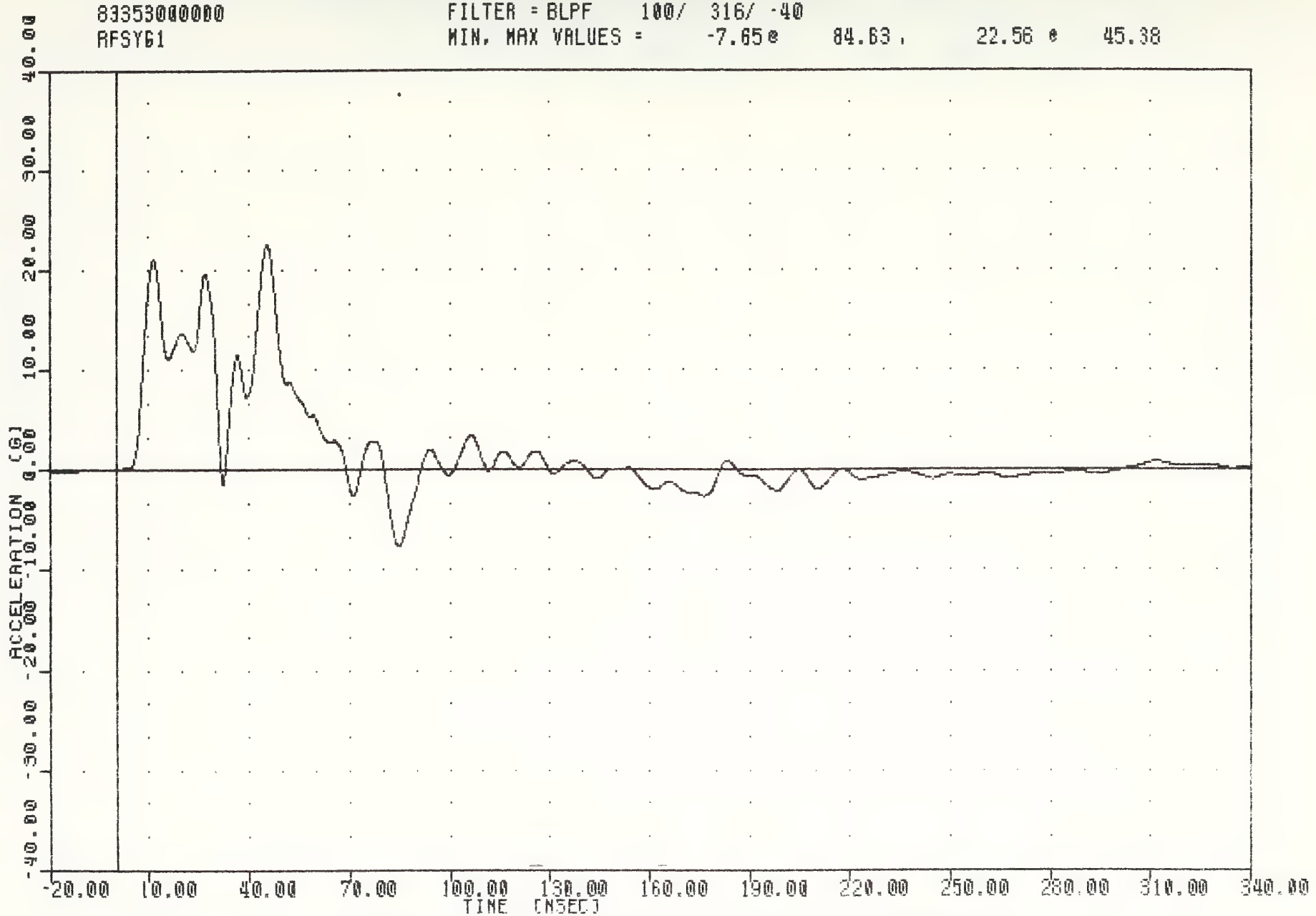
MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER PELVIS ACCELERATION Z AXIS


IRC , 831219
PLOT DATE 27-DEC-83 11:15:47
SIDE PROTECTION - 2DA/40A
83353000000
PEVRG3
FILTER = BLPF 300/ 949/ -40
MIN, MAX VALUES = 0.15@ -1.00@, 164.14 @ 32.25
ACCELERATION (G)
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO CITATION
PASSENGER PELVIS RESULTANT

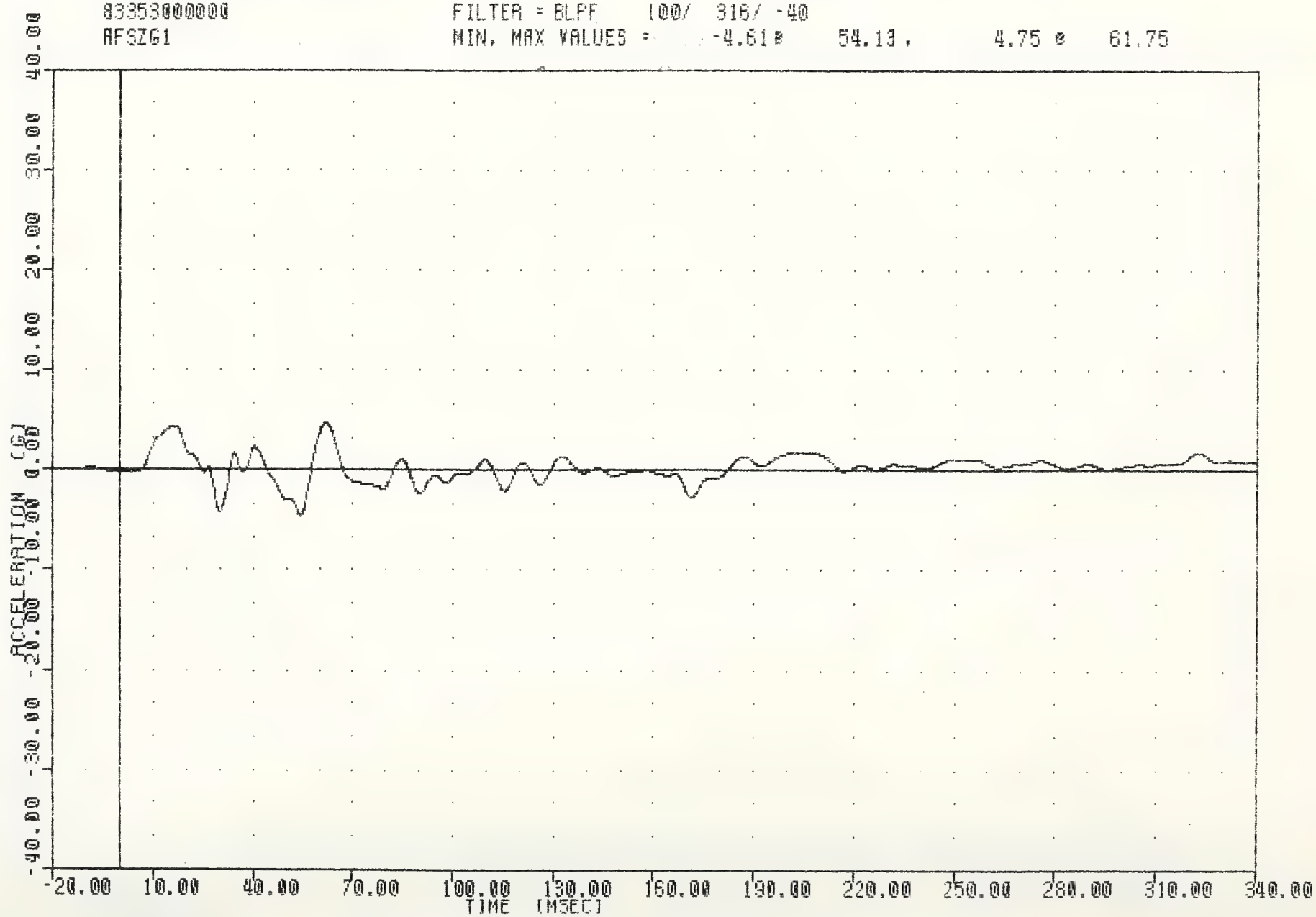

TRC , 831219 PLOT DATE 27-DEC-83 13:22:05
SIDE PROTECTION - 2DR/4DR
FILTER = BLPF 300/ 949/ -40
PEVYY3
MIN. MAX VALUES = -0.04 @ 25.50 , 28.04 @ 42.88
VELOCITY (MPH)
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING PEVYG3



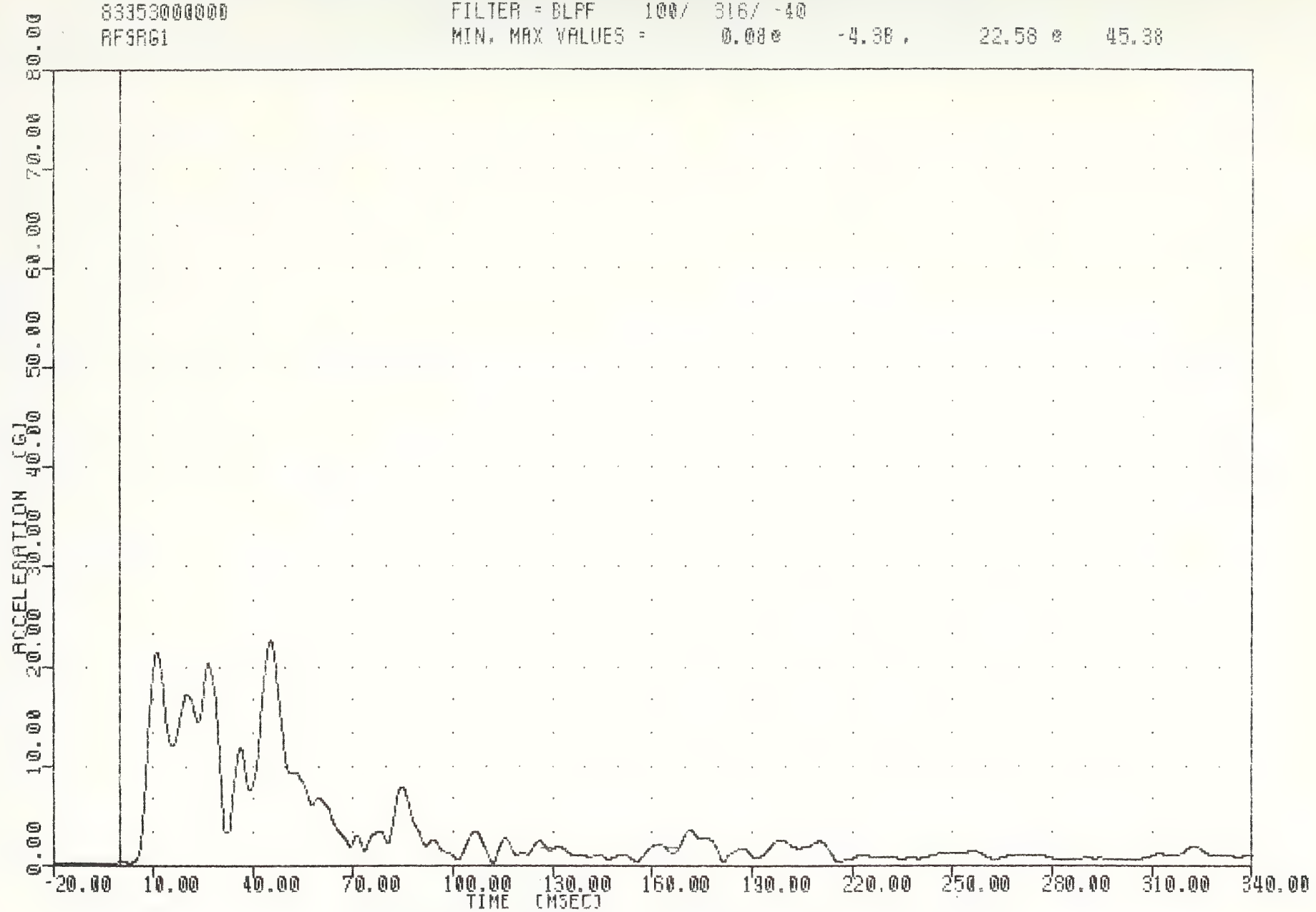
MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE RIGHT FRONT SILL ACCELERATION X AXIS



MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE RIGHT FRONT SILL ACCELERATION Y AXIS

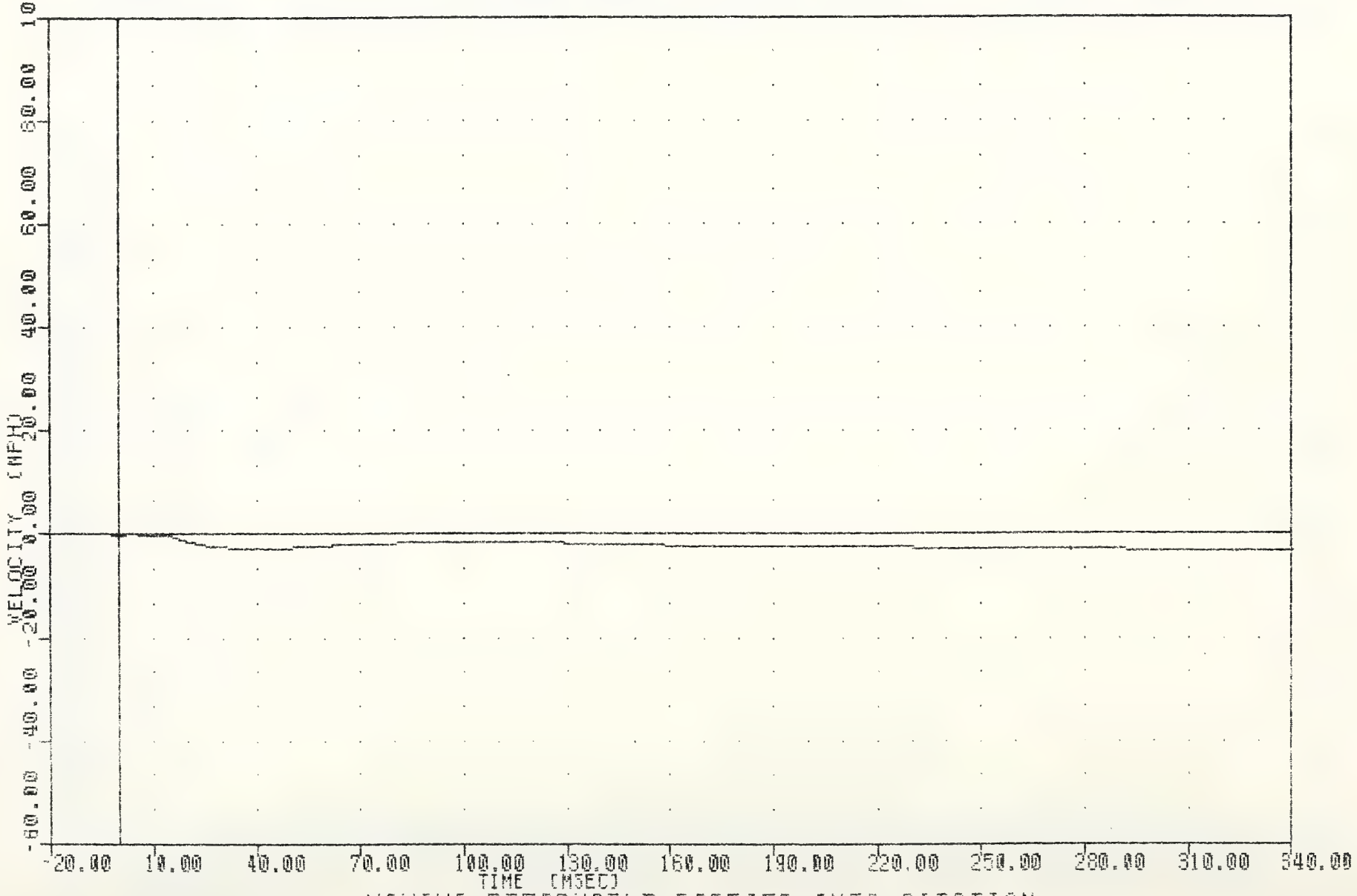


MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE RIGHT FRONT SILL ACCELERATION Z AXIS

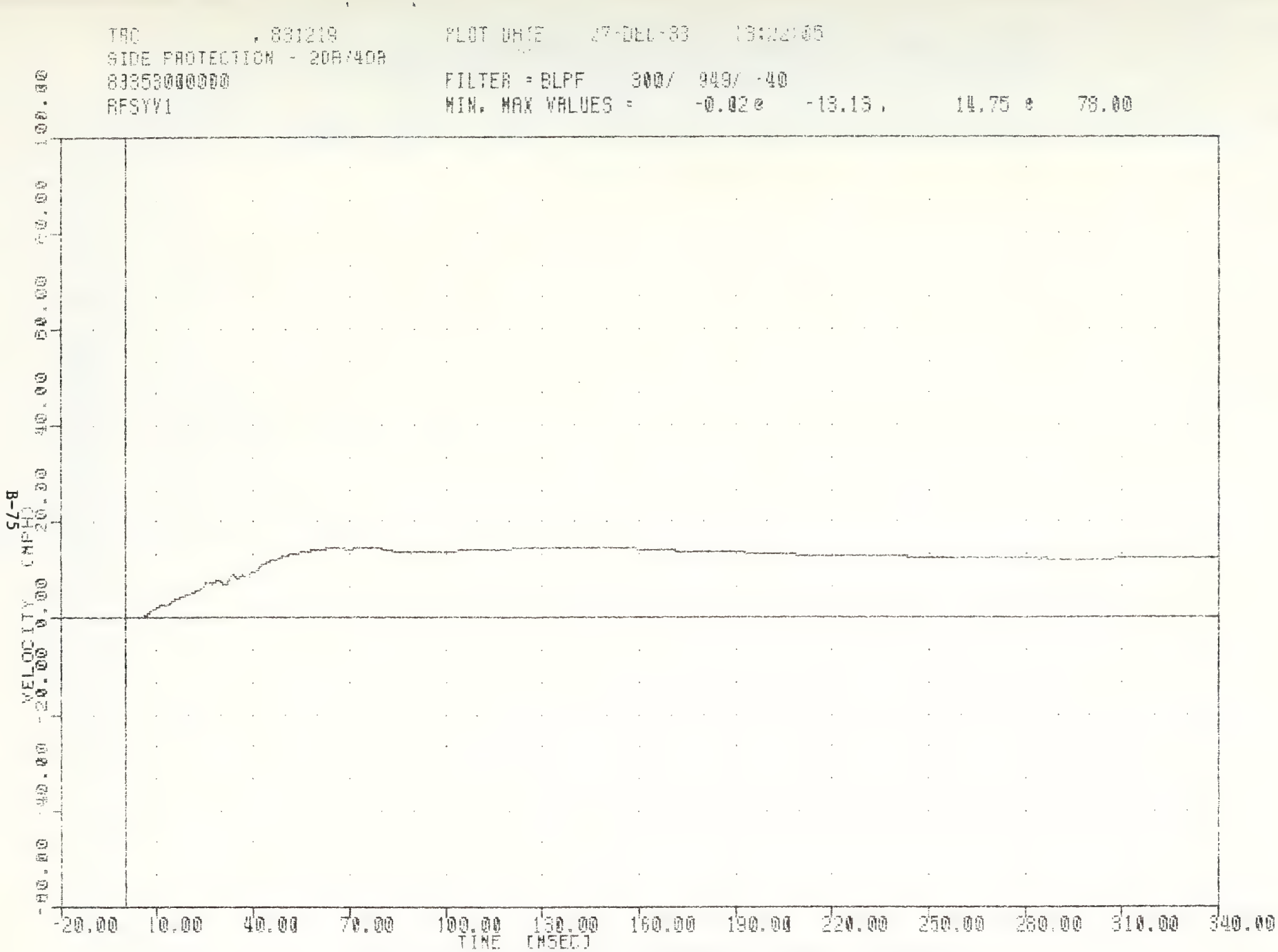


MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE RIGHT FRONT SILL RESULTANT

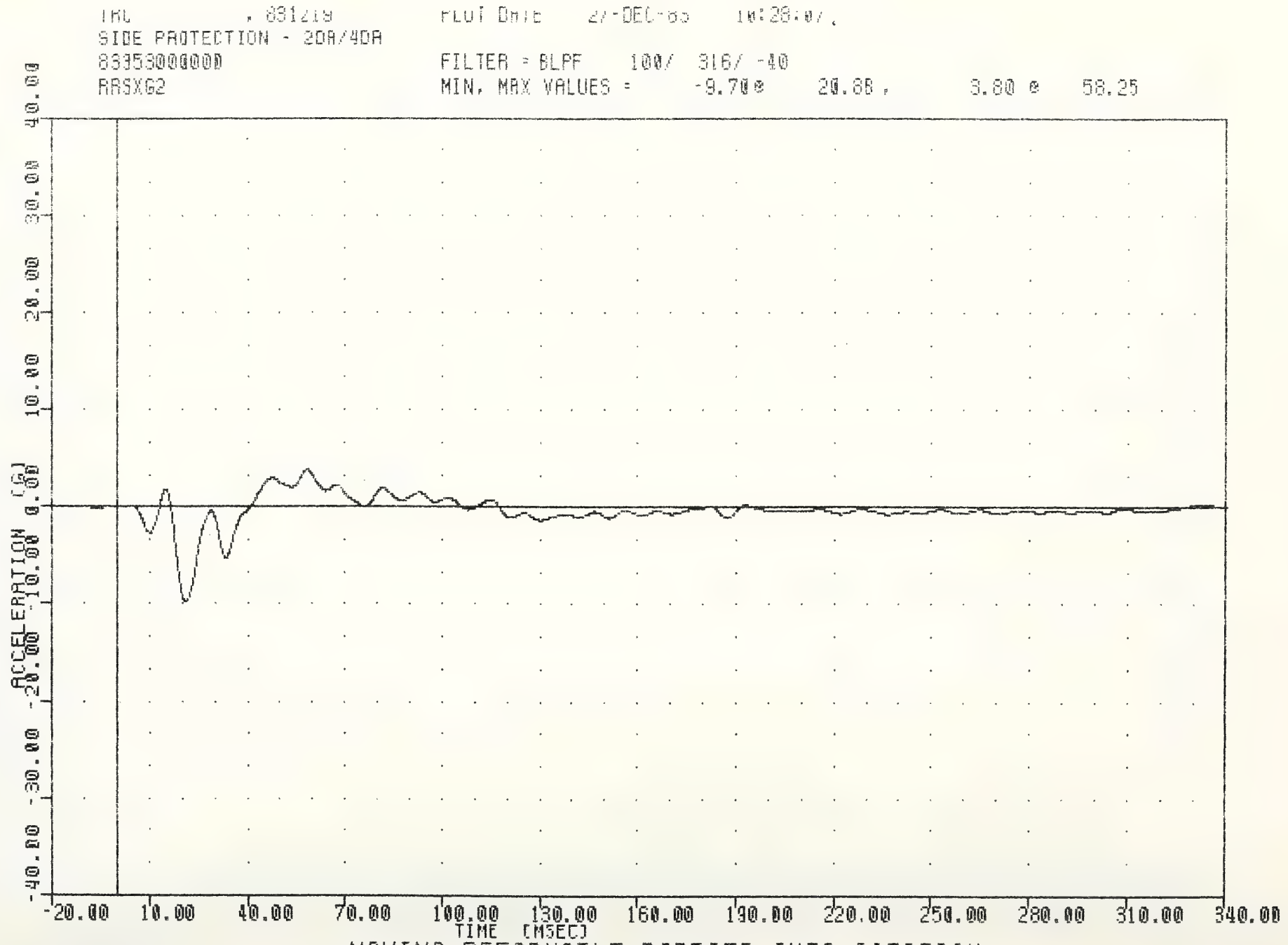
TRC , 831219 PLOT DATE 27-DEC-83 13:22:05
SIDE PROTECTION - 2DA/4DA
83353000000 FILTER = BLPF 300/ 949/ -40
RFSXV1 MIN. MAX VALUES = -3.18@ 316.38 , 0.00 @ -20.00



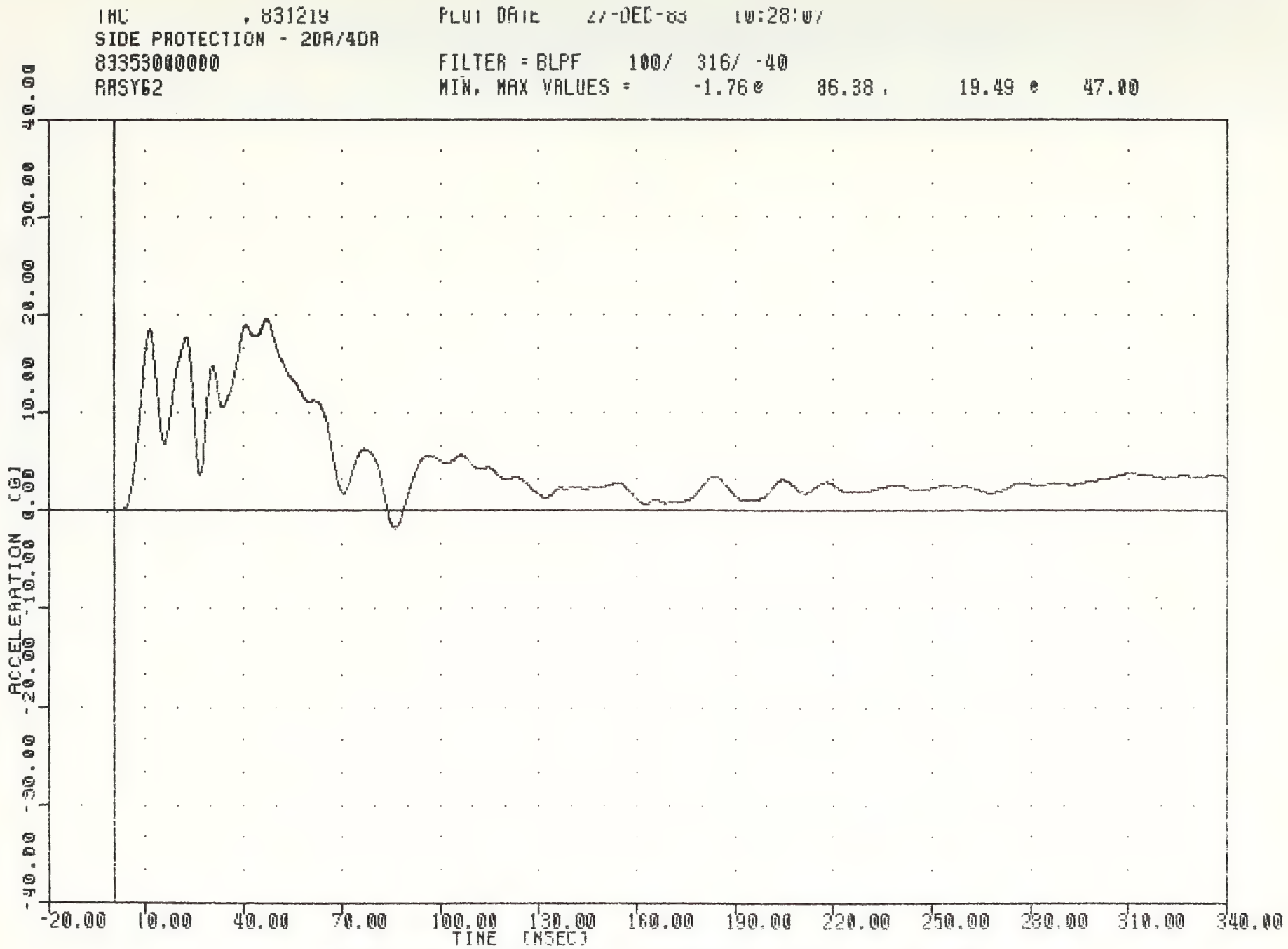
MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING RFSXG1



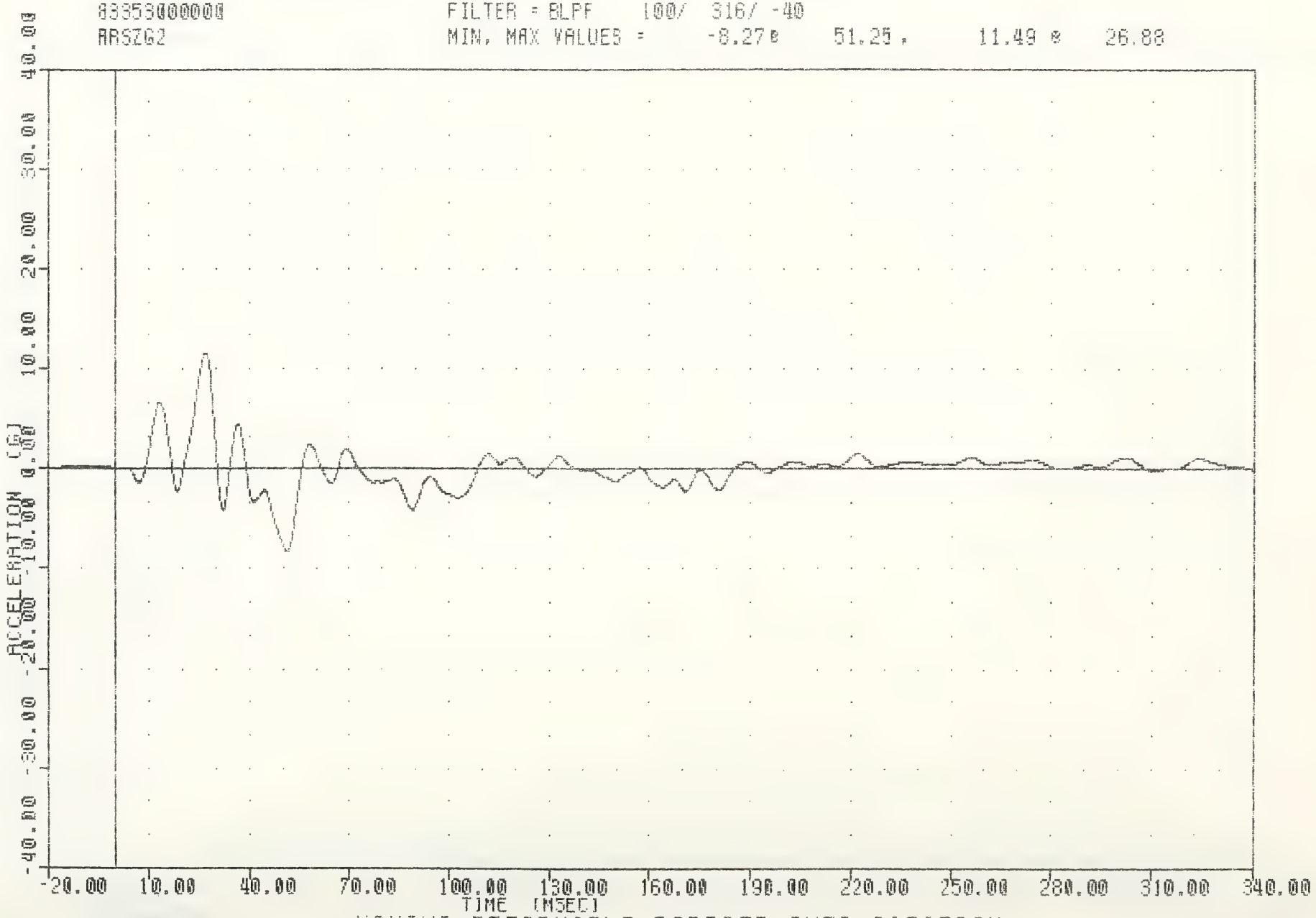
MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING RFSYG1



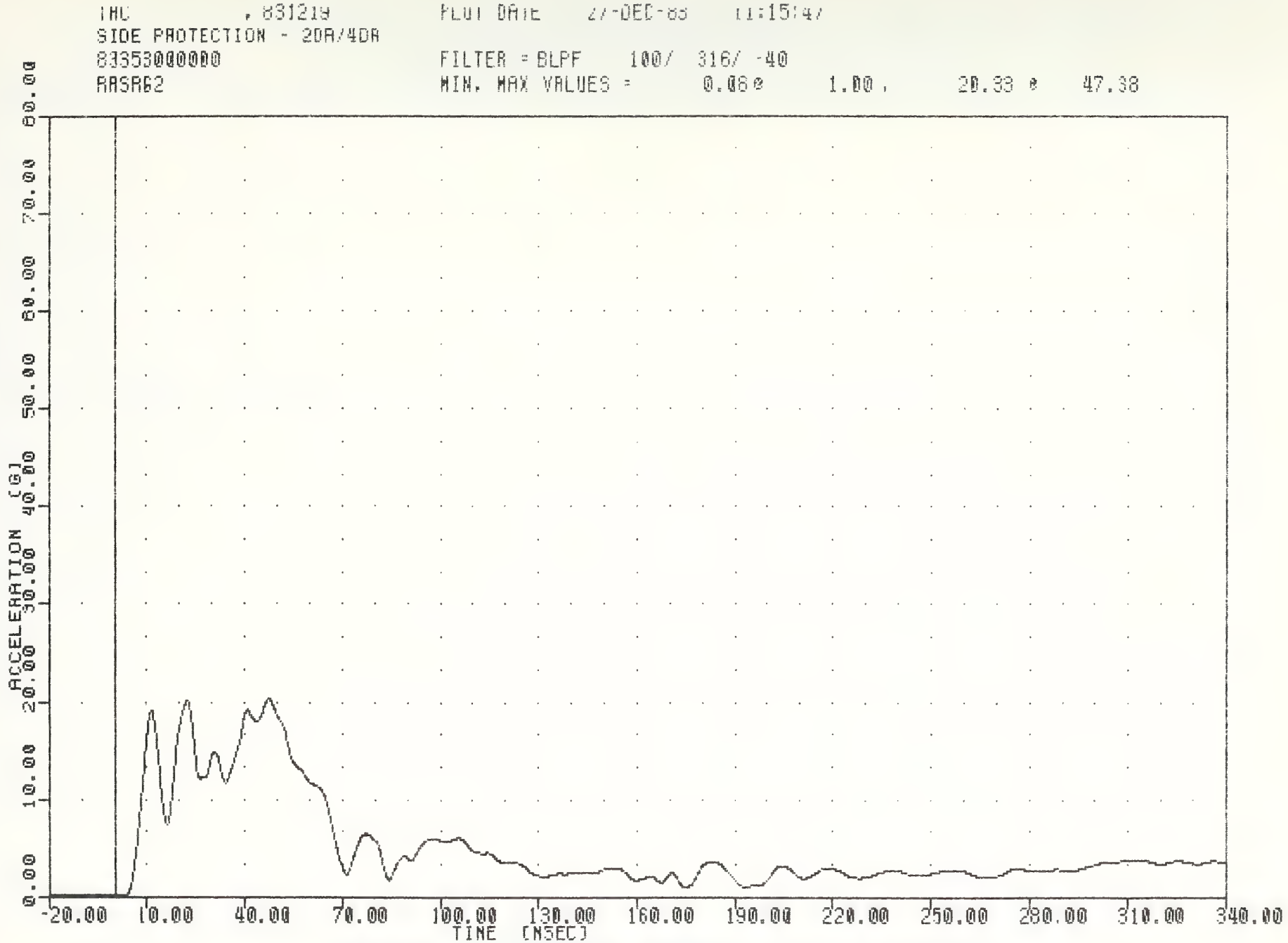
MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE RIGHT REAR SILL ACCELERATION X AXIS



MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE RIGHT REAR SILL ACCELERATION Y AXIS

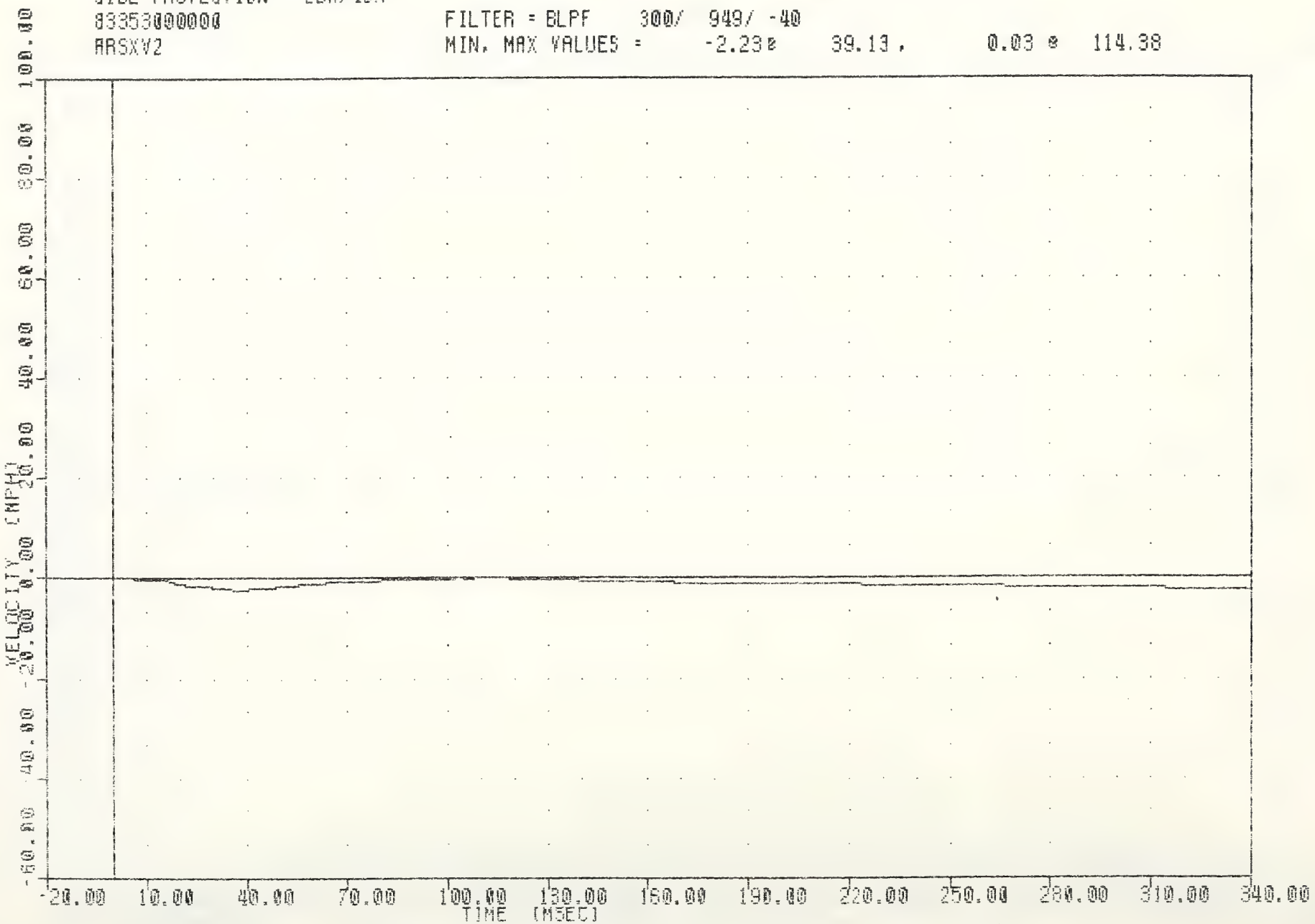


MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE RIGHT REAR SILL ACCELERATION Z AXIS

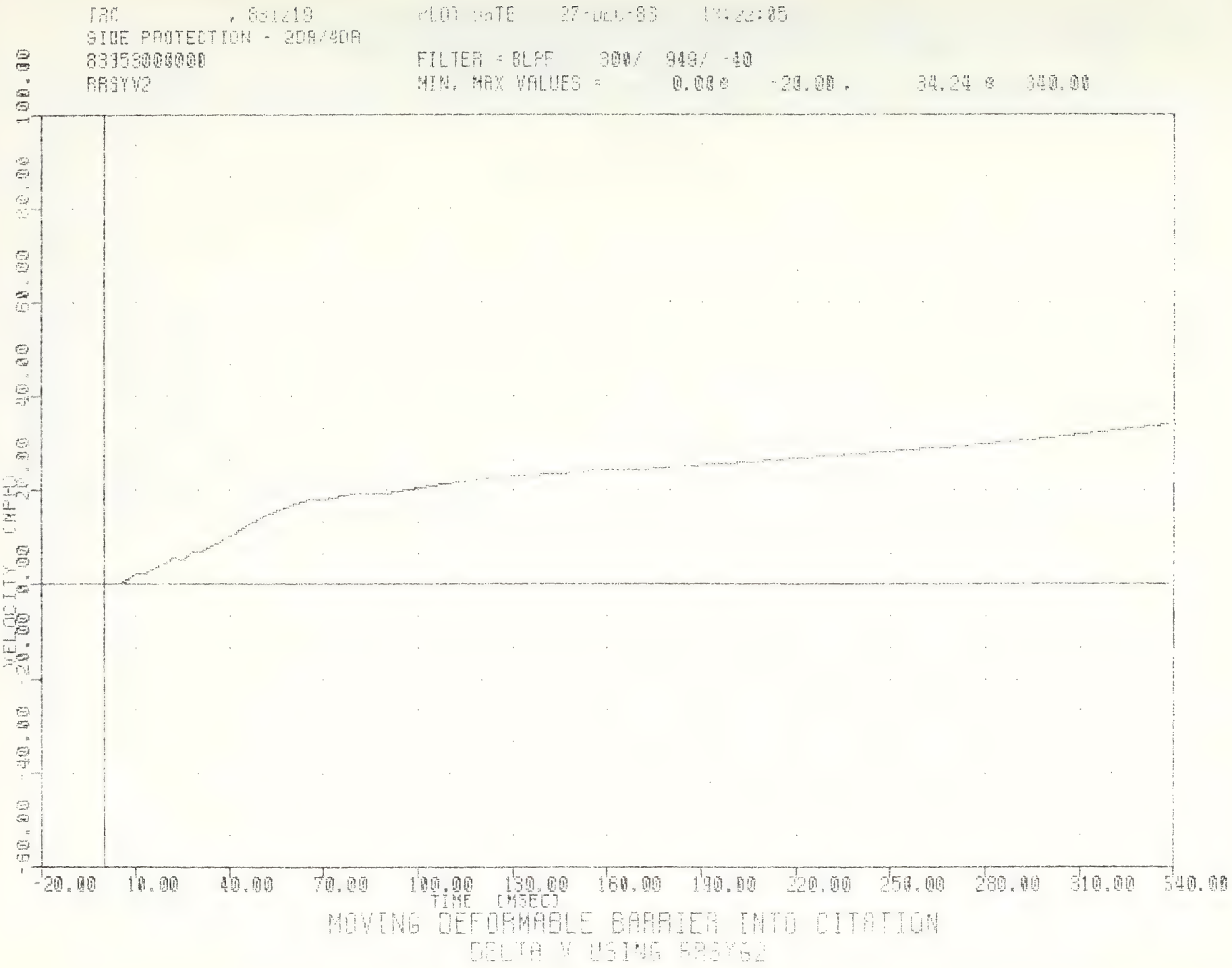


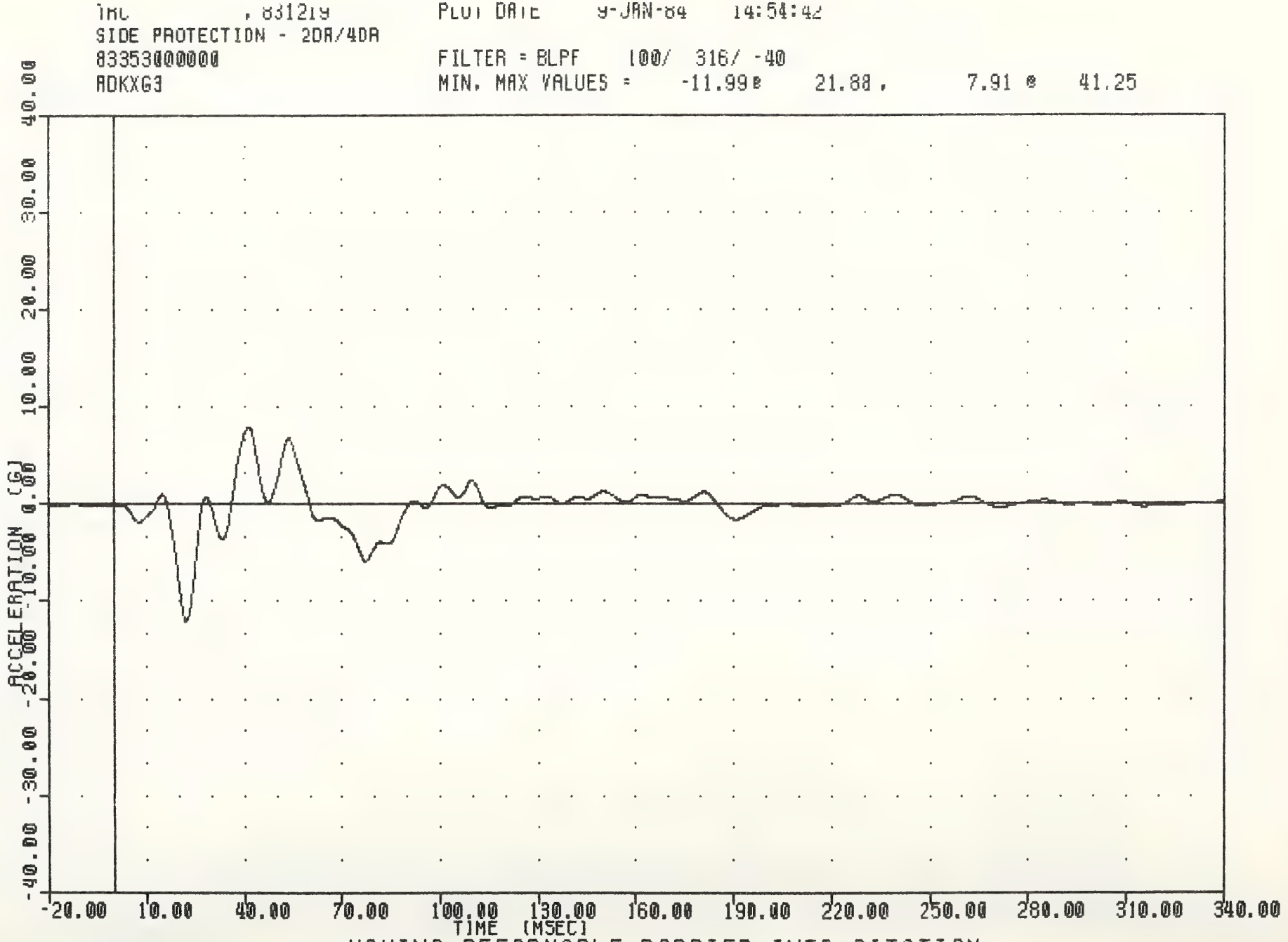
MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE RIGHT REAR SILL RESULTANT

IRC , 831219 PLOT DATE 27-OCT-83 13:22:05
SIDE PROTECTION - 20A/40A
83353000000 FILTER = BLPF 300/ 949/ -40
ARSXV2 MIN, MAX VALUES = -2.23 @ 39.13 , 0.03 @ 114.38

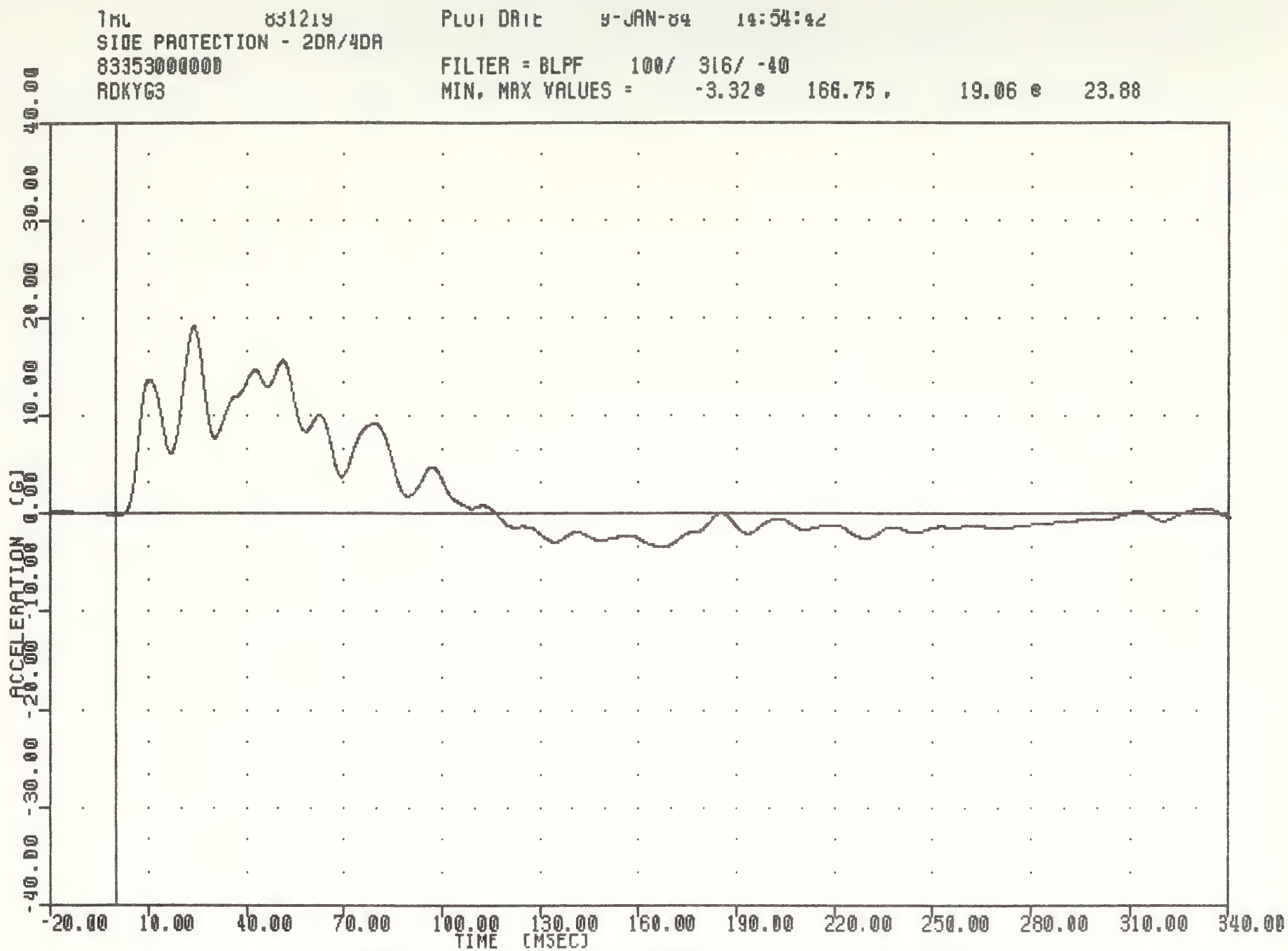


MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING ARSXGC

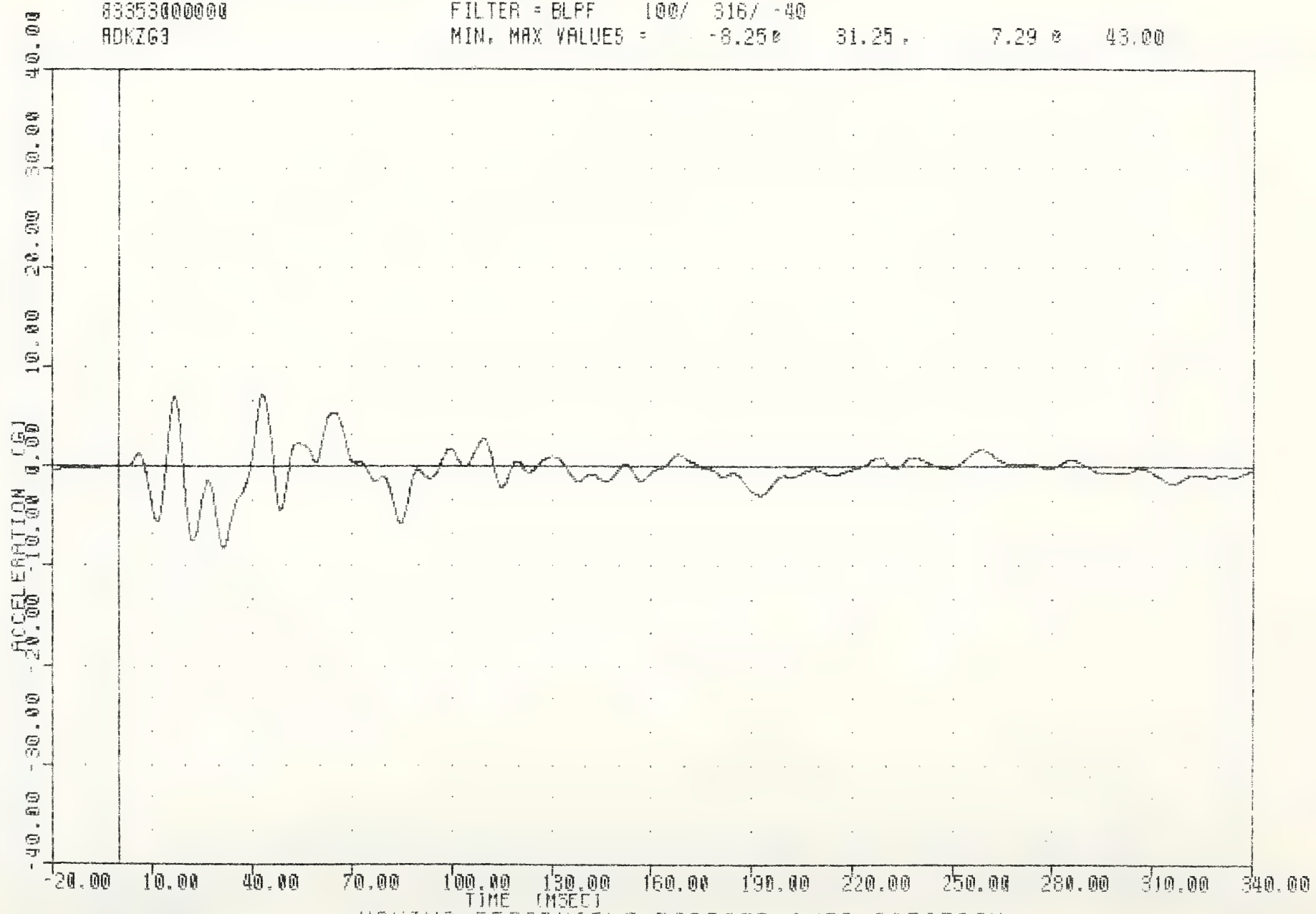

IRC , 83120 PLOT DATE 27-JUL-83 14:22:05
SIDE PROTECTION - 20P/40A
83358000000 FILTER = BLPF 300/ 949/ -10
RRSYV2 MIN, MAX VALUES = 0.00 @ -20.00 , 34.24 @ 300.00
100.00
80.00
60.00
40.00
20.00
0.00
-20.00
-40.00
-60.00
VELOCITY (MPH)
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING RRSYV2



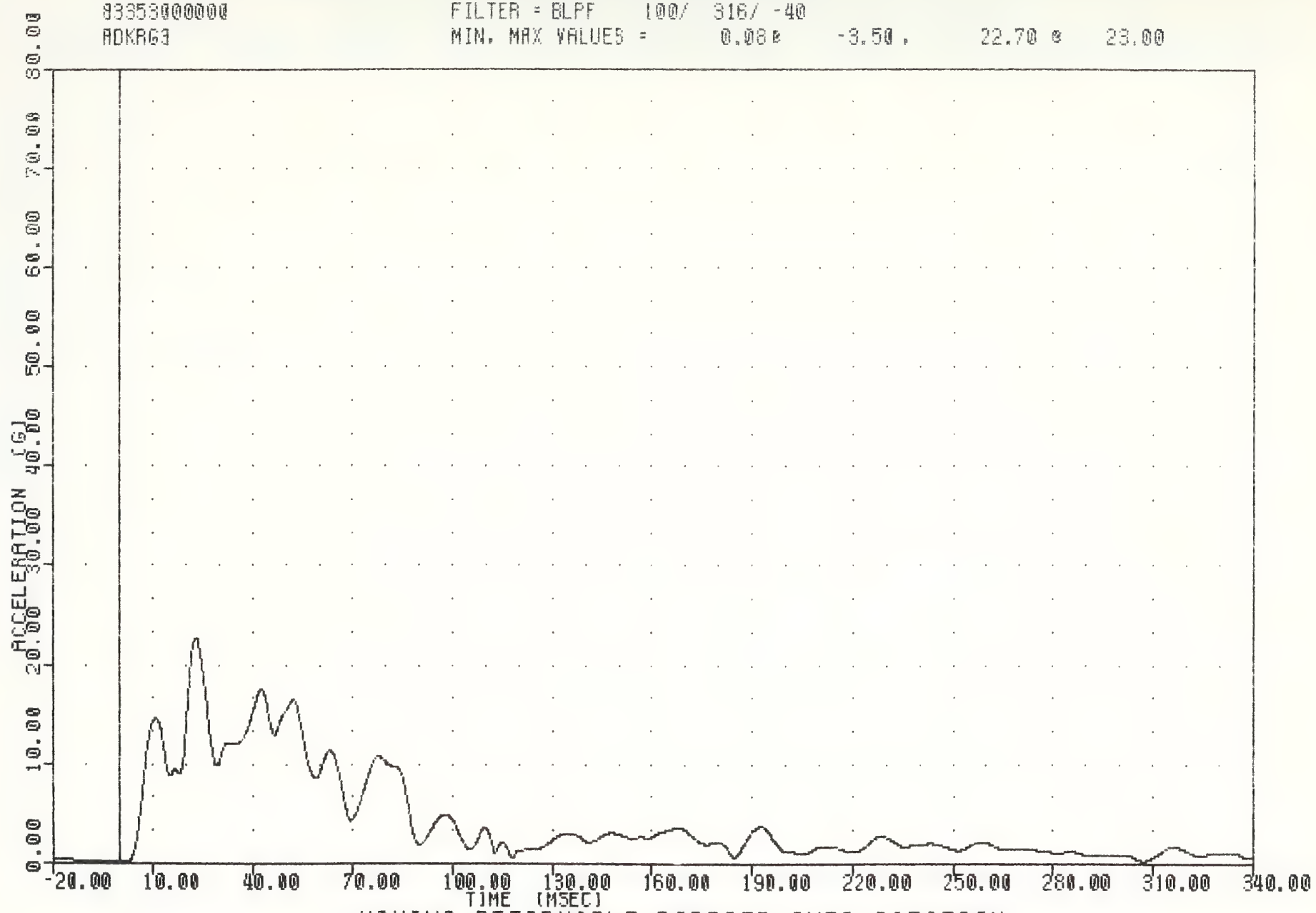
MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE REAR DECK ACCELERATION X AXIS



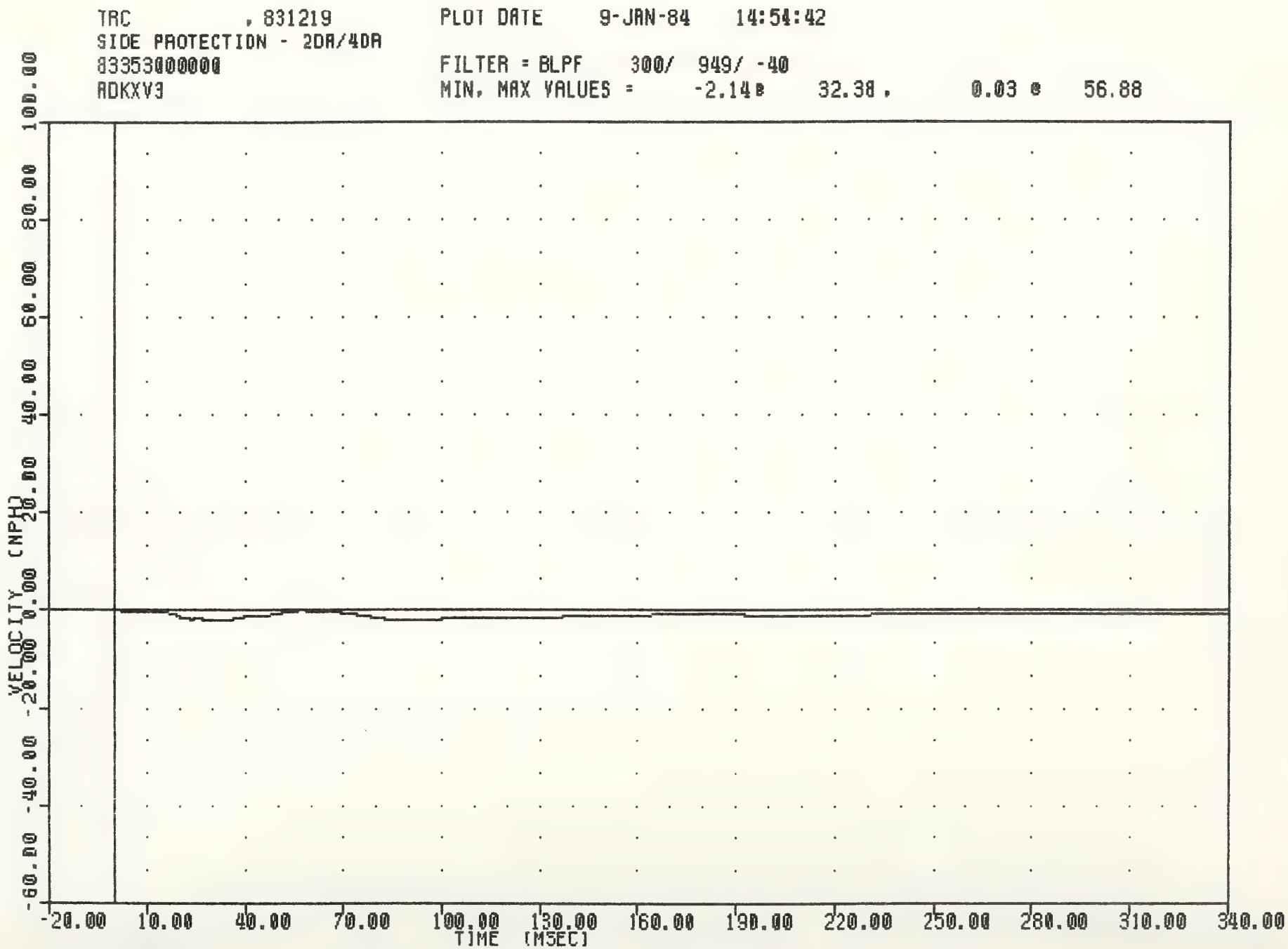
MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE REAR DECK ACCELERATION Y AXIS



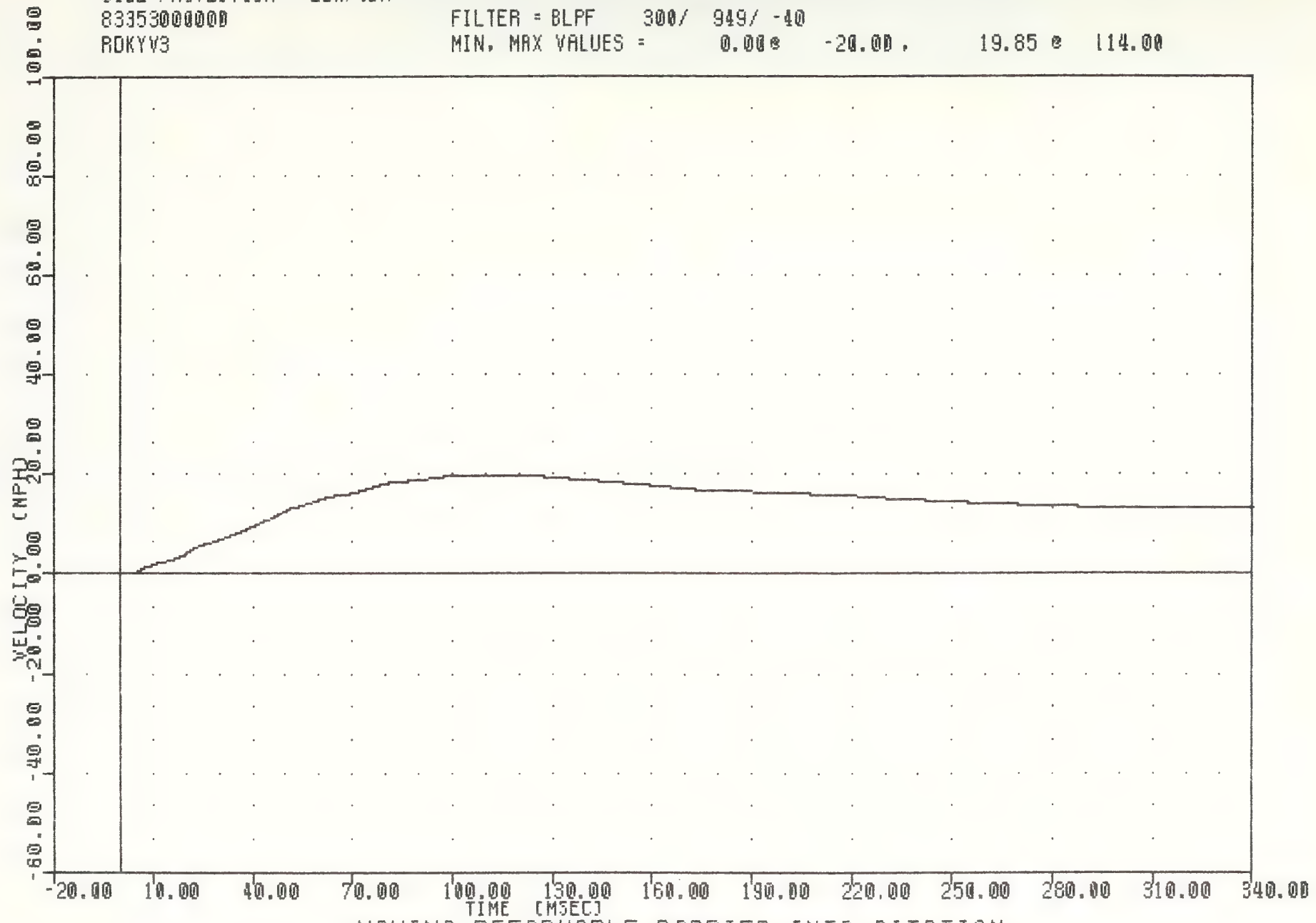
MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE REAR DECK ACCELERATION Z AXIS



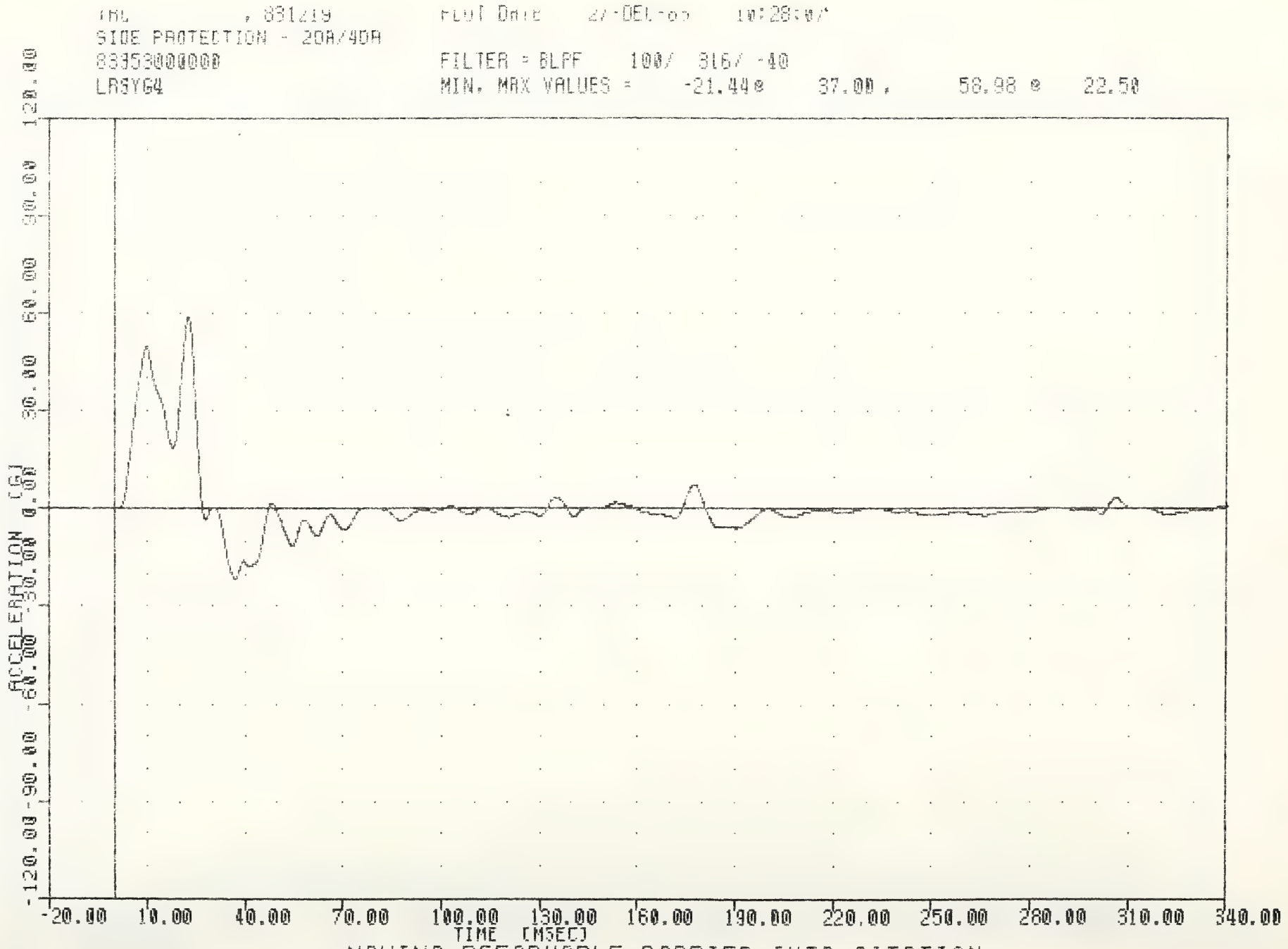
MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE REAR DECK RESULTANT



MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING RDKXG3

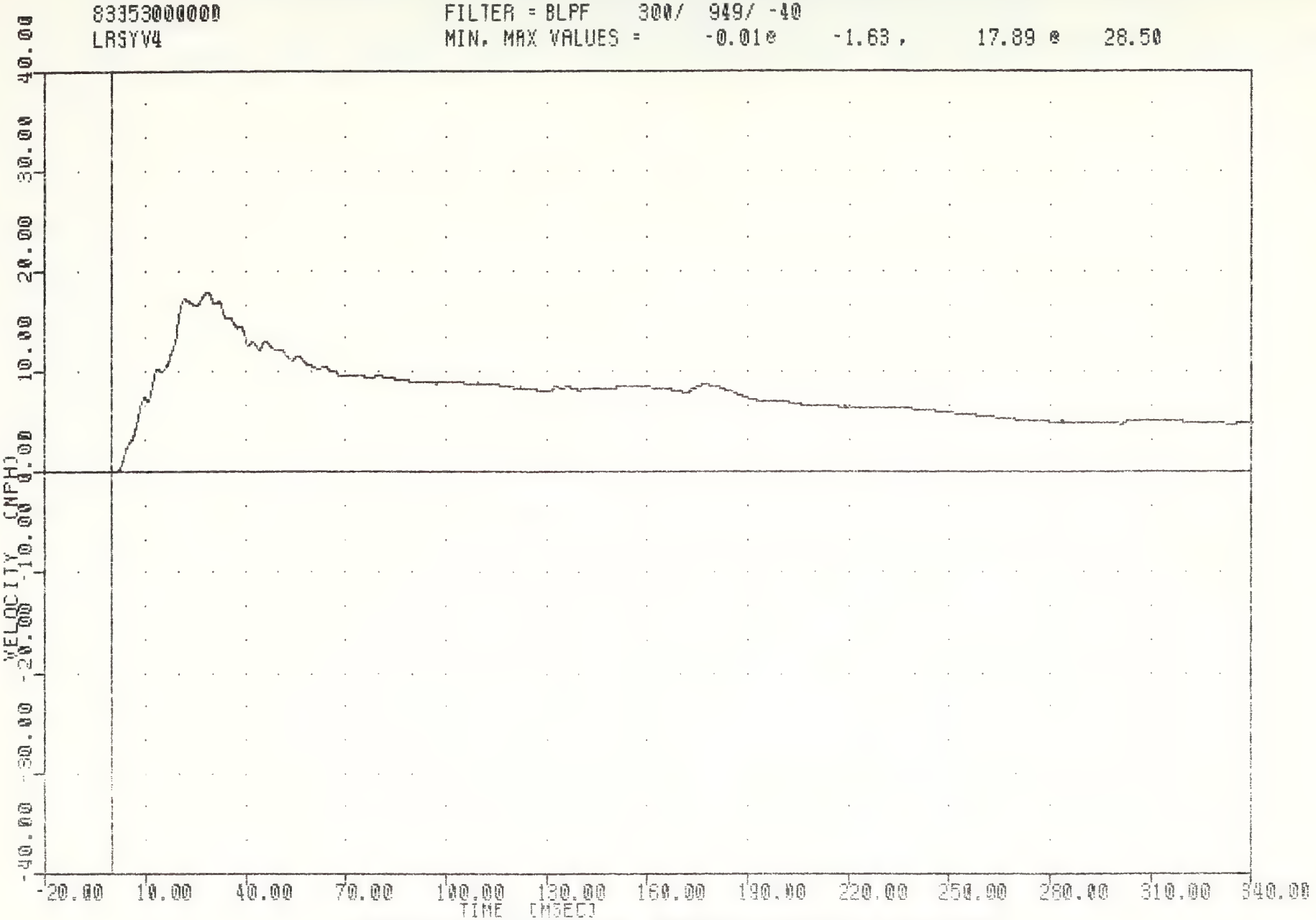


MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING RDKYG3

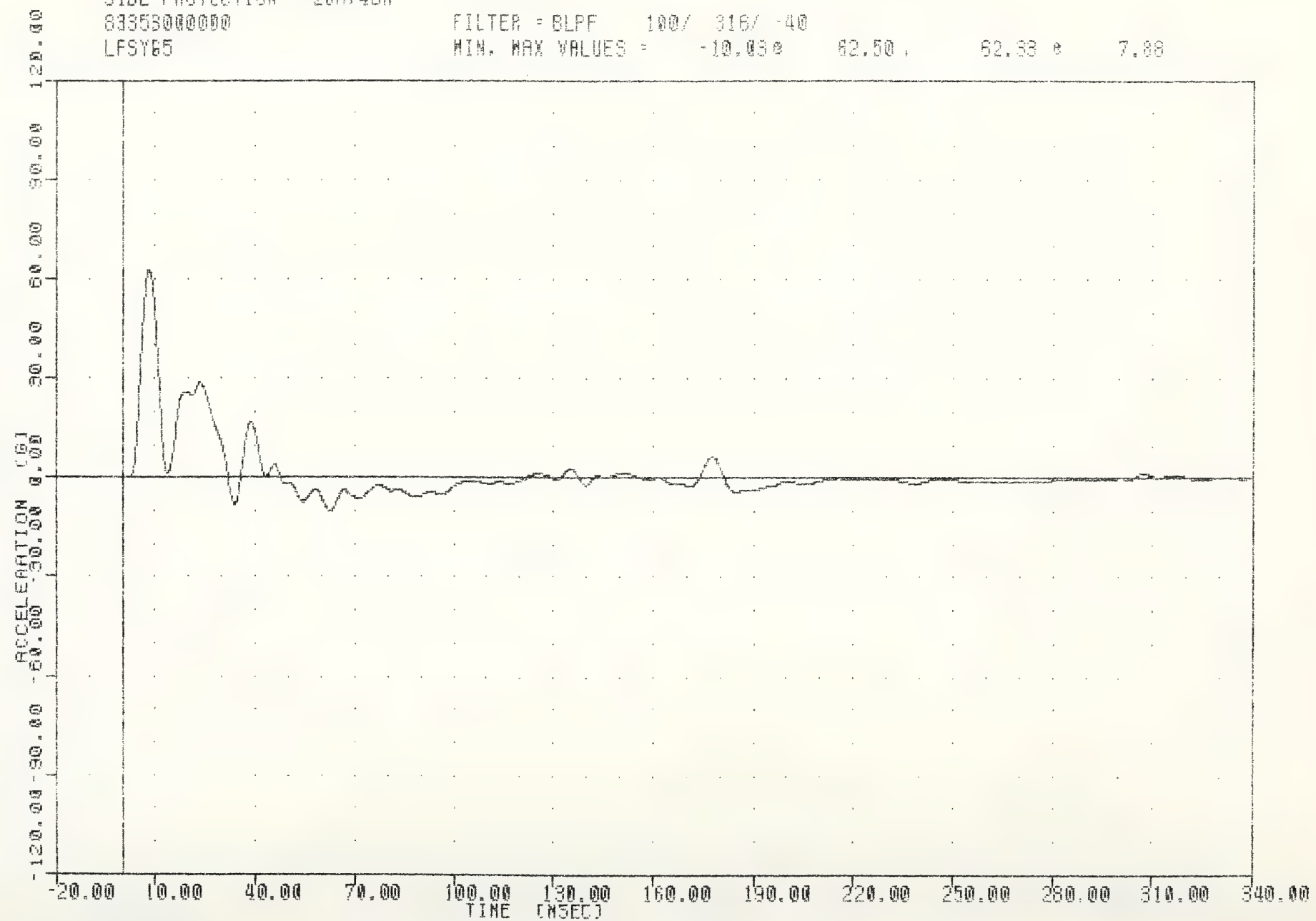


MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE LEFT REAR SILL ACCELERATION Y AXIS

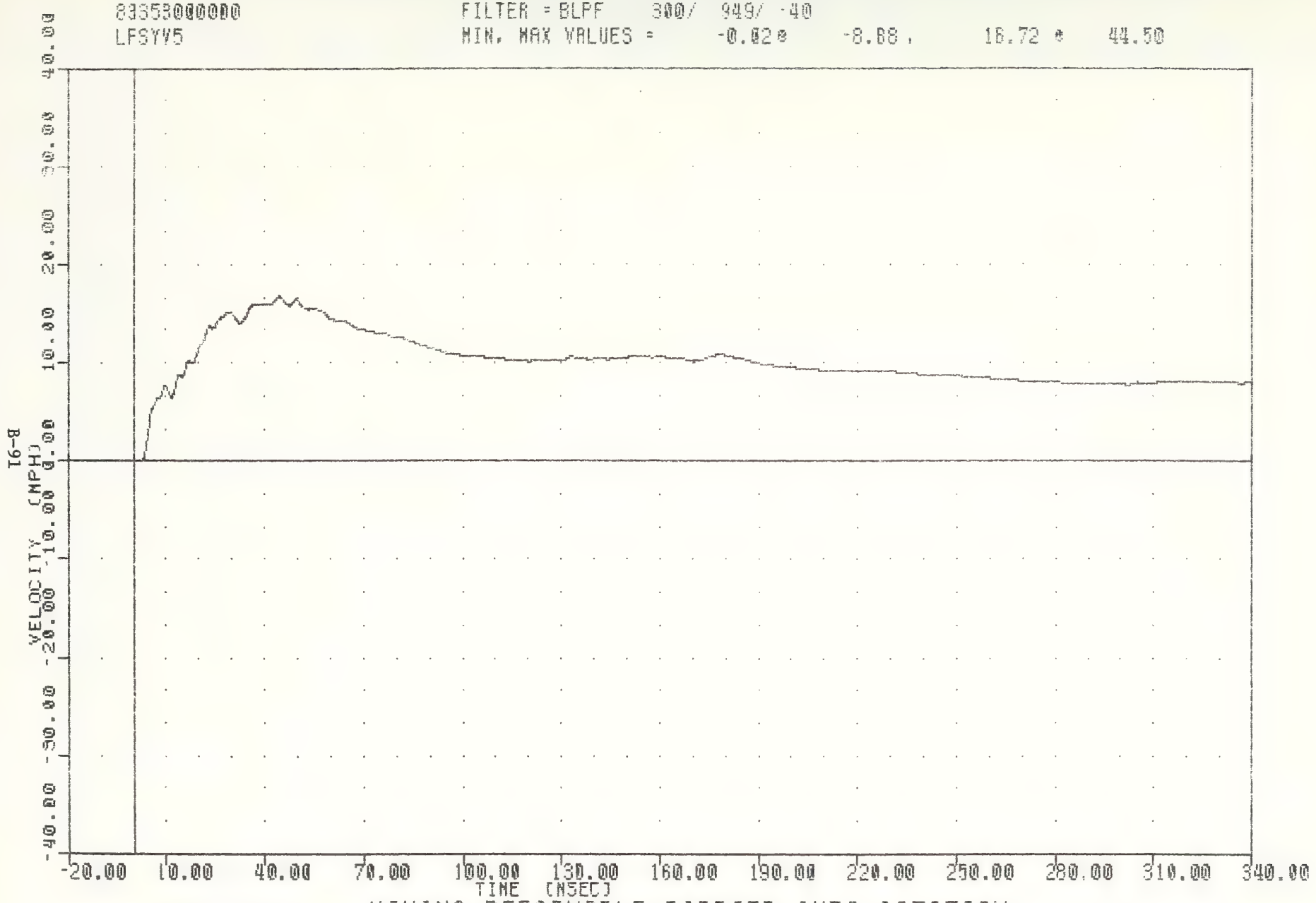
TRC , 831219 PLOT DATE 27-DEC-83 13:22:05
SIDE PROTECTION - 2DA/4DA
833530000000 FILTER = BLPF 300/ 949/ -40
LRSYV4 MIN, MAX VALUES = -0.01@ -1.63 , 17.89 @ 28.50



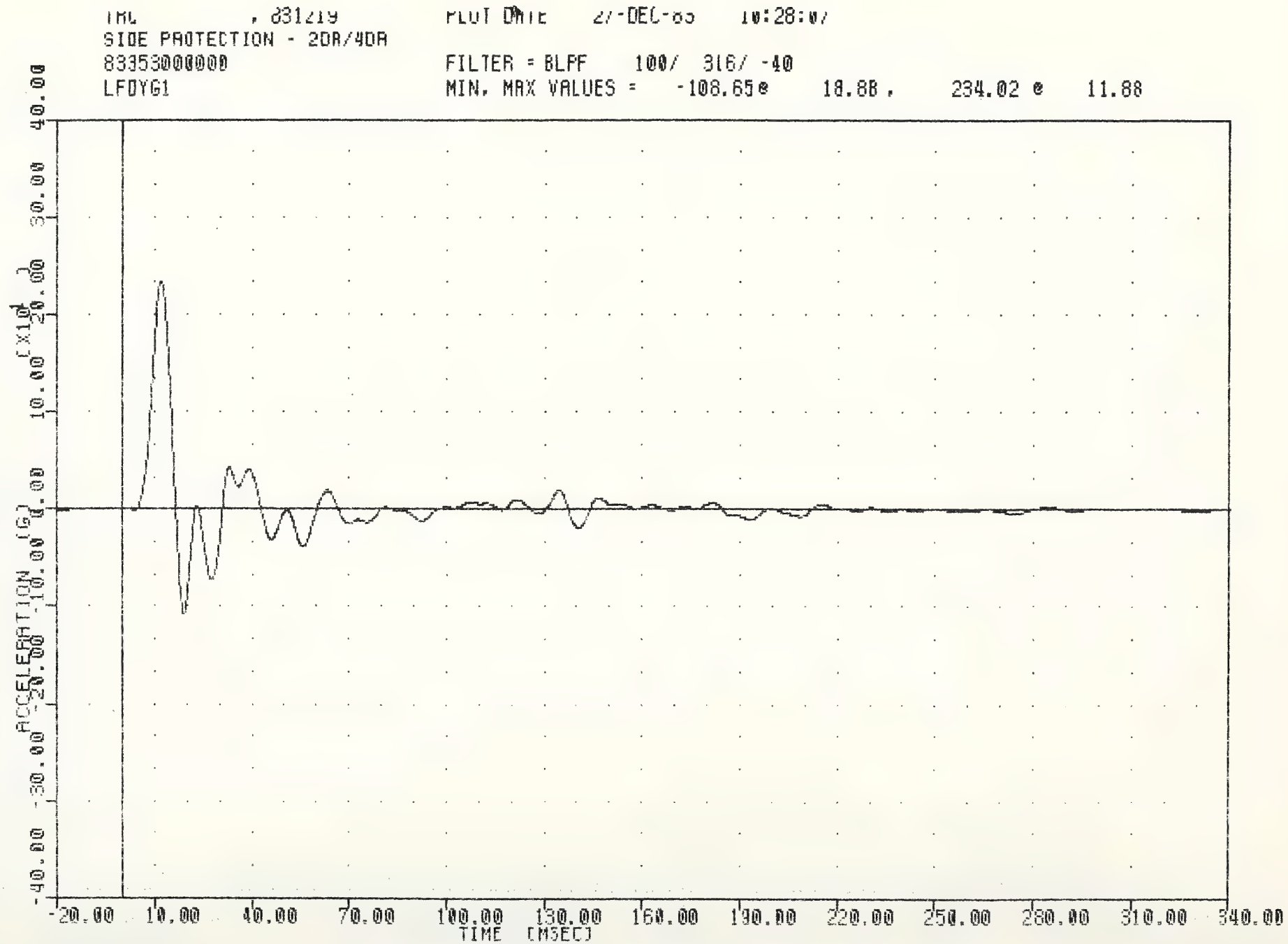
MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING LRSYV4



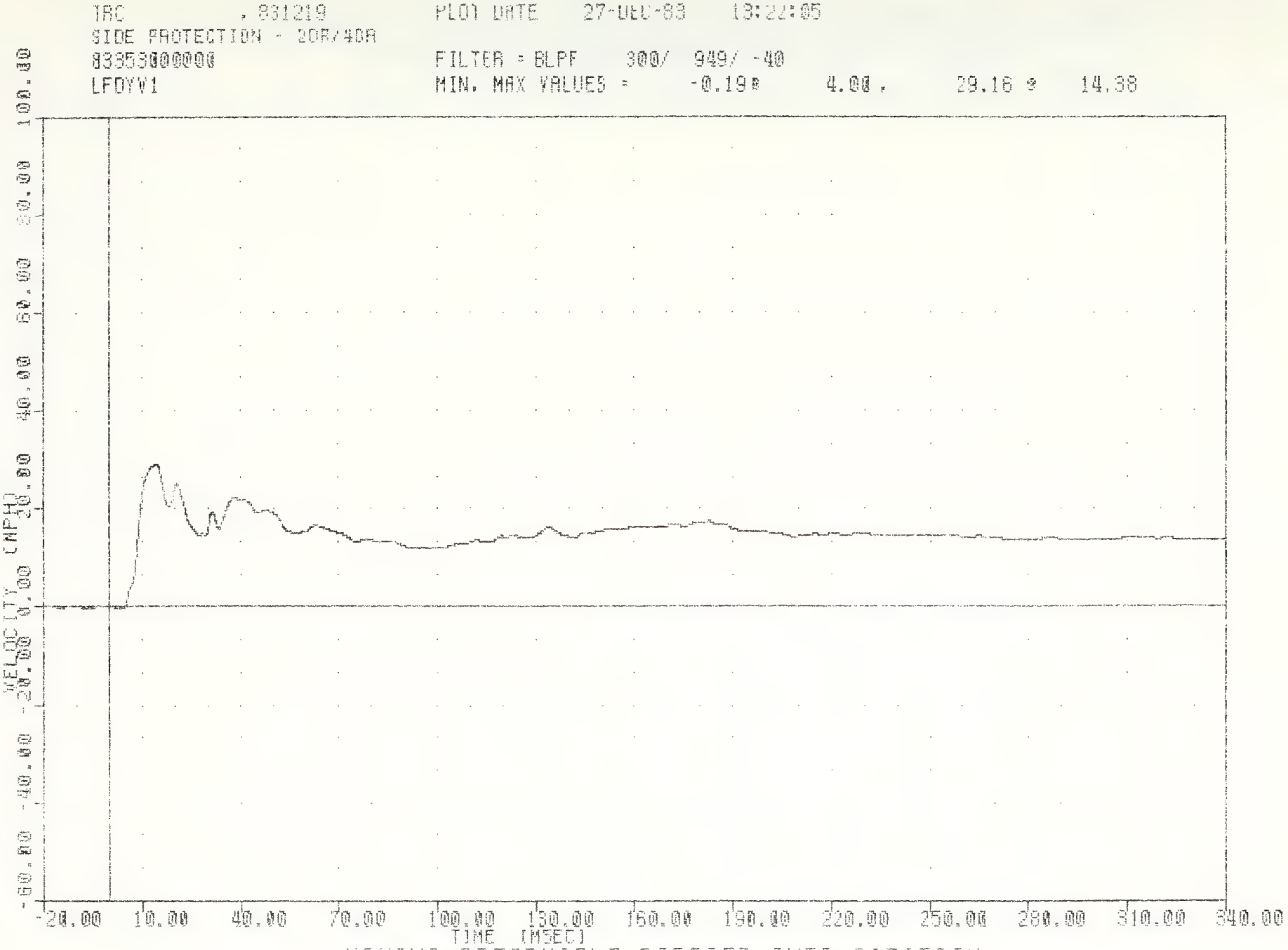
MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE LEFT FRONT SILL ACCELERATION Y AXIS

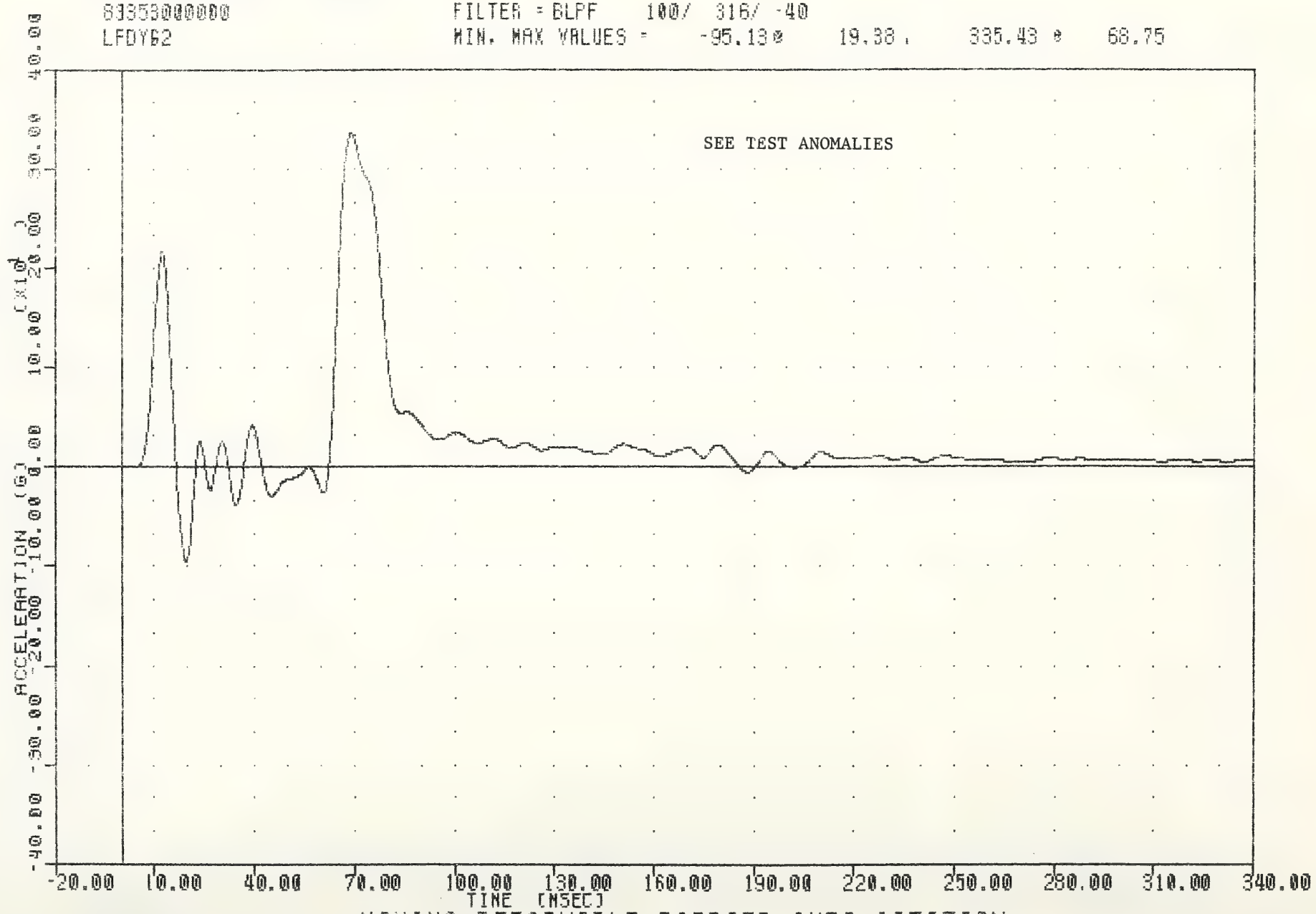


MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING LFSYG5

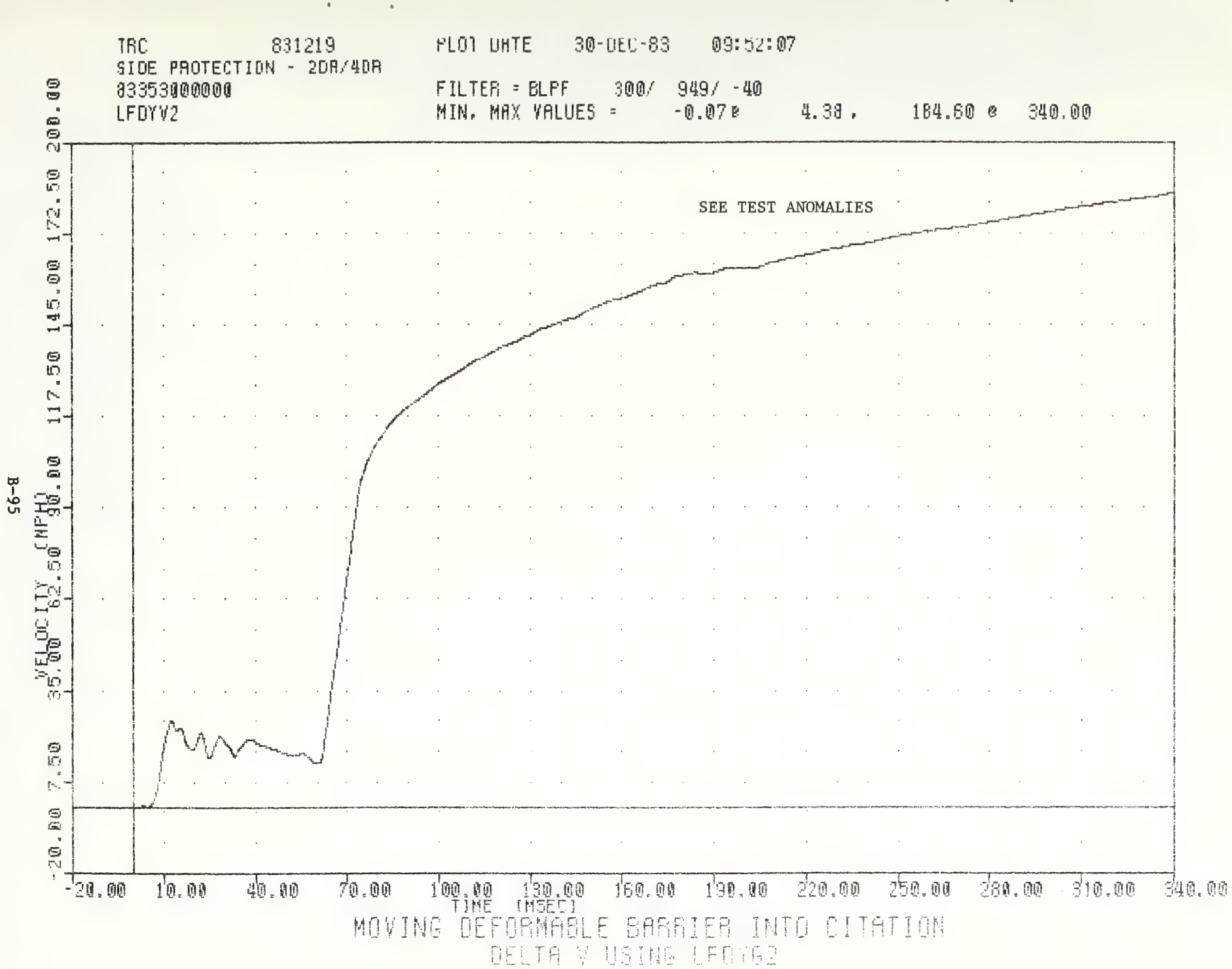


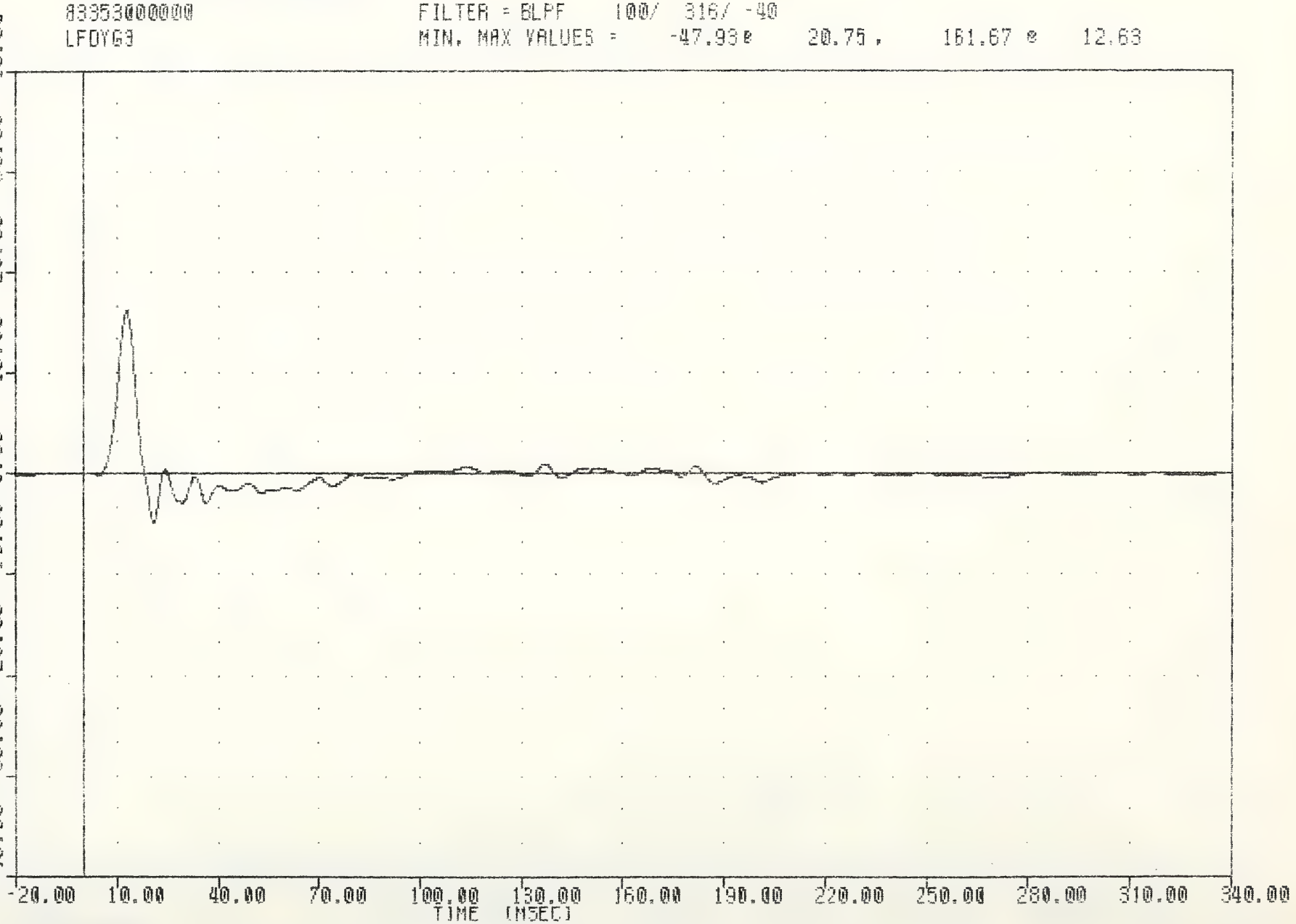
MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE LEFT FRONT DOOR (POSITION 6) ACCELERATION Y AXIS


TRC , 831219
PLOT DATE 27-DEC-83 13:22:05
SIDE PROTECTION - 20R/40R
833530000006
FILTER = BLPF 300/ 949/ -40
LFOYV1
MIN, MAX VALUES = -0.19@ 4.00@ 29.16@ 14.38
VELOCITY (MPH)
100.00
80.00
60.00
40.00
20.00
0.00
-20.00
-40.00
-60.00
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING LFOYG1



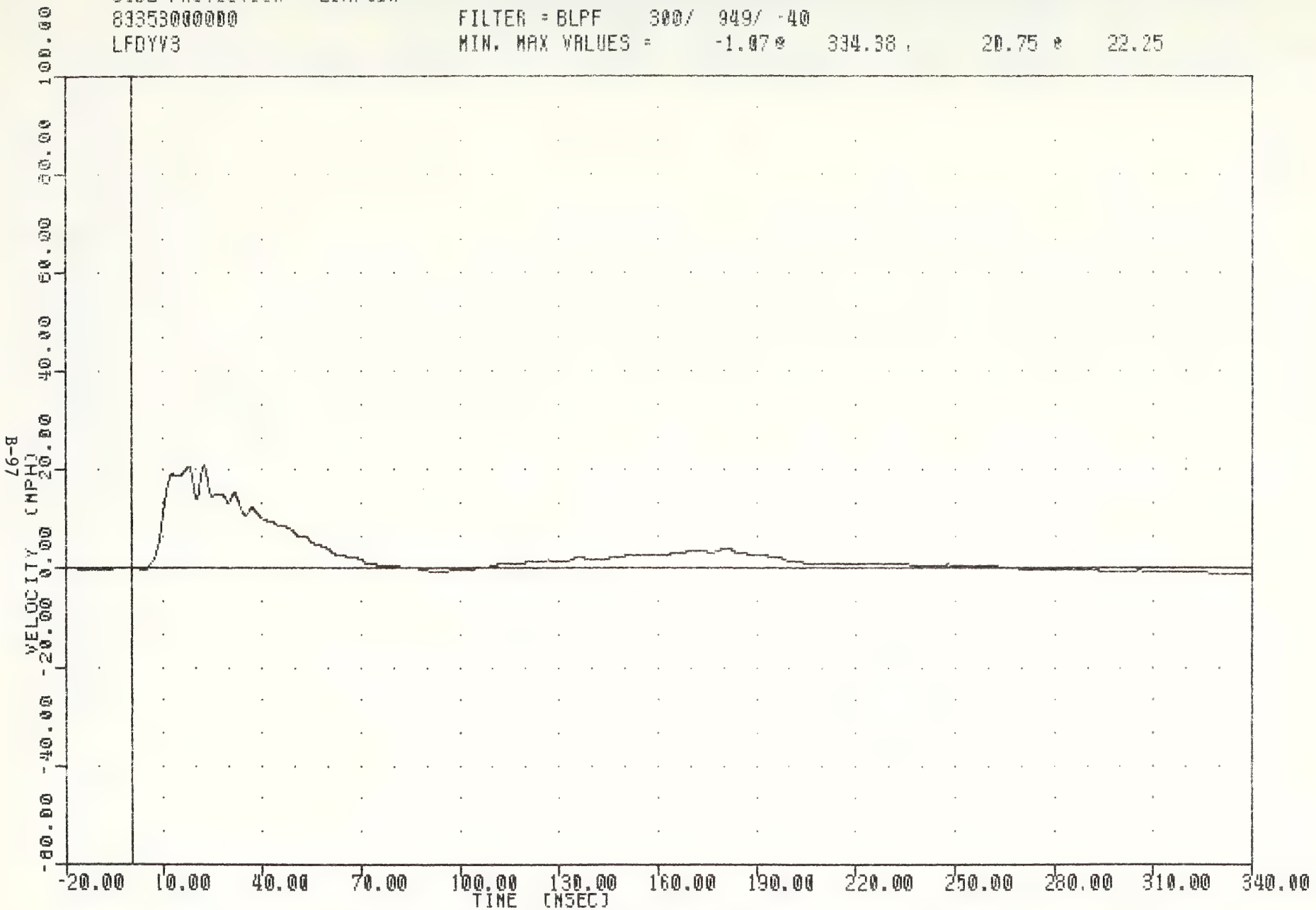
MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE LEFT FRONT DOOR (POSITION 8) ACCELERATION Y AXIS


TRC 831219
PLOT DATE 30-DEC-83 09:52:07
SIDE PROTECTION - 2DR/4DR
83353000000
FILTER = BLPF 300/ 949/ -40
LFDYV2
MIN, MAX VALUES = -0.07 @ 4.38 , 184.60 @ 340.00
SEE TEST ANOMALIES
VELOCITY (MPH)
-20.00
7.50
35.00
62.50
90.00
117.50
145.00
172.50
200.00
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING LFDYV2

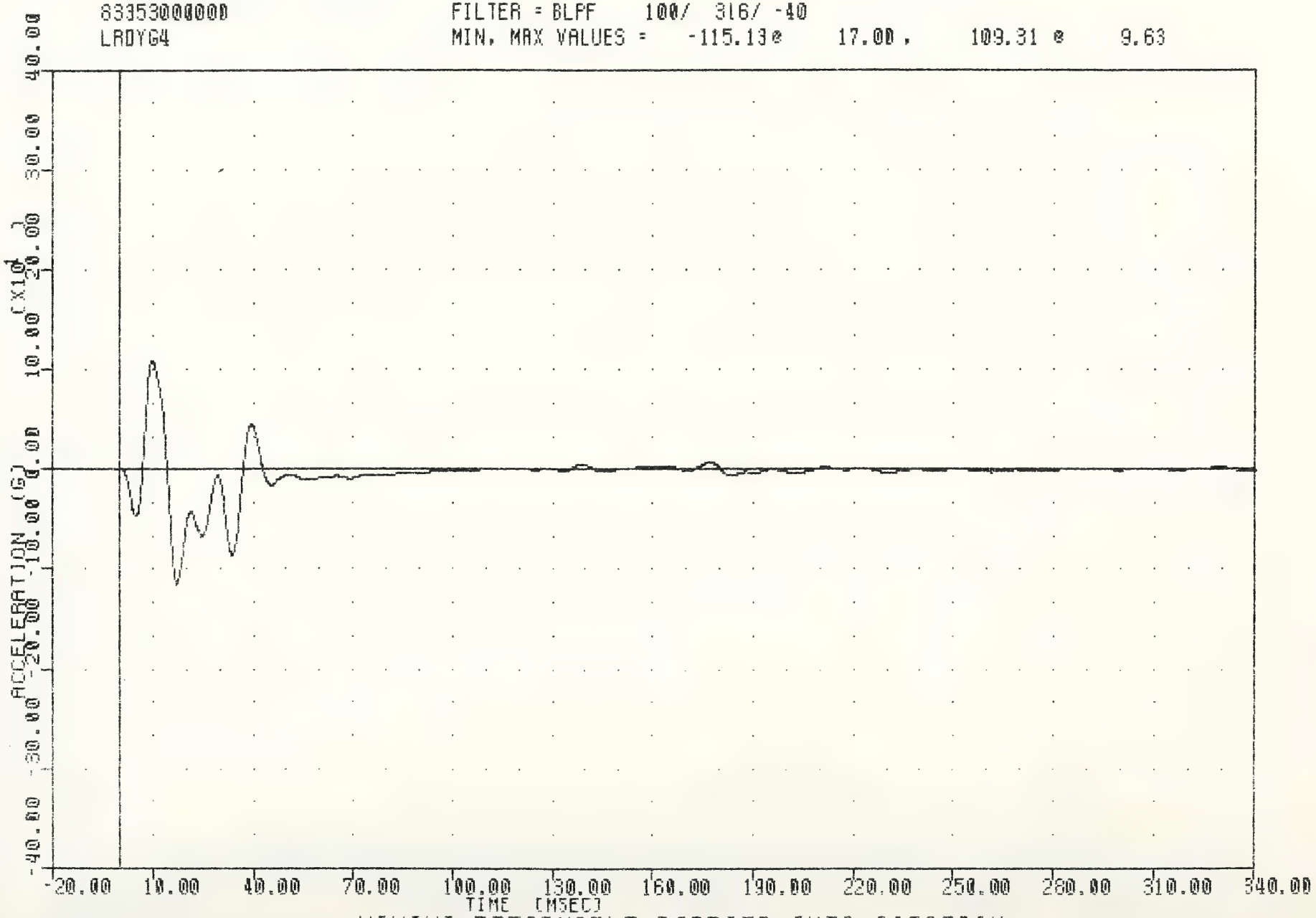


MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE LEFT FRONT DOOR (POSITION 9) ACCELERATION Y AXIS

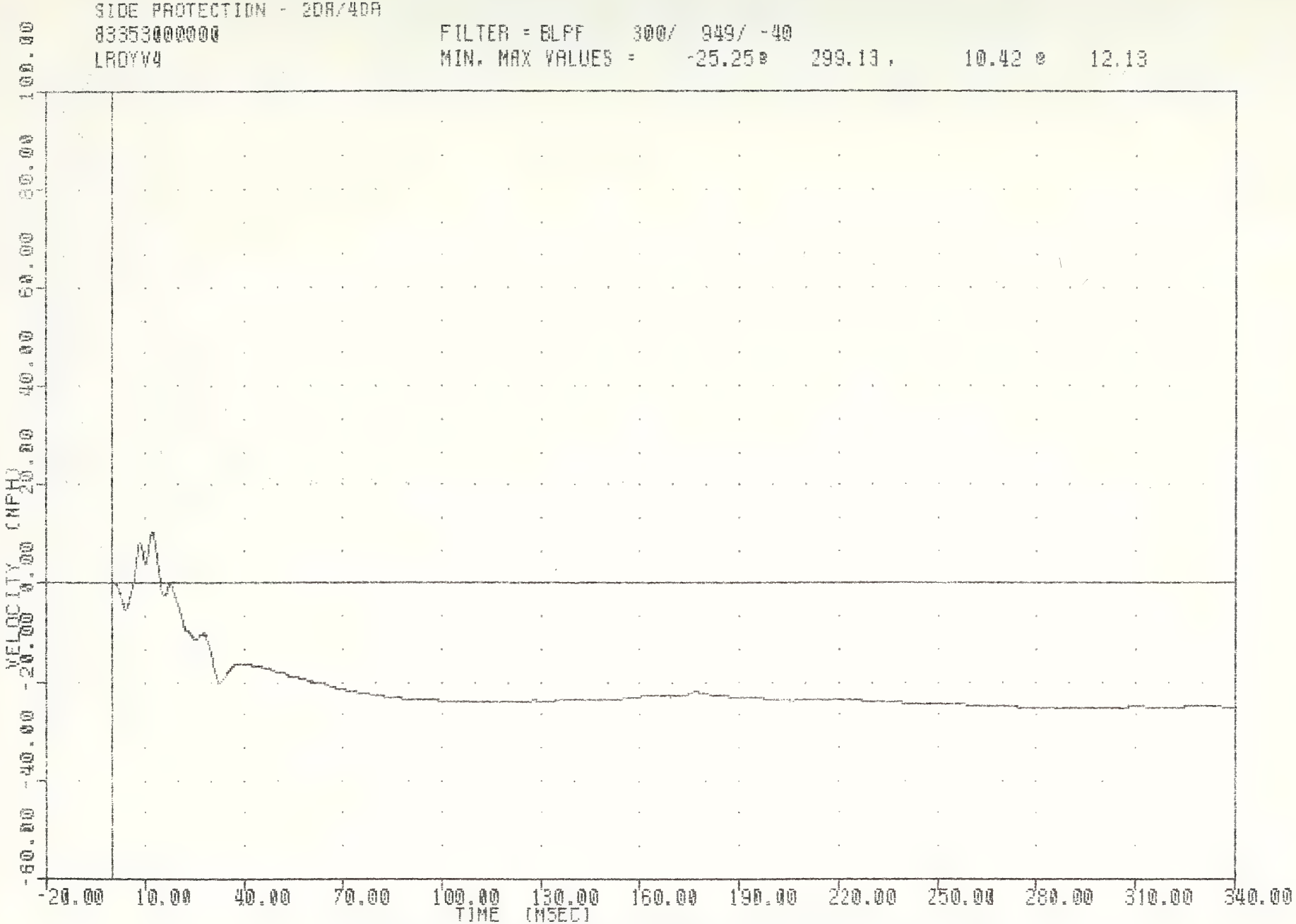
TRC , 831219 PLOT DATE 27-DEC-83 13:22:05
SIDE PROTECTION - 20A/4DA
833530@@@@@@ FILTER = BLPF 300/ 949/ -40
LFDYV3 MIN. MAX VALUES = -1.07 @ 334.38 , 20.75 @ 22.25



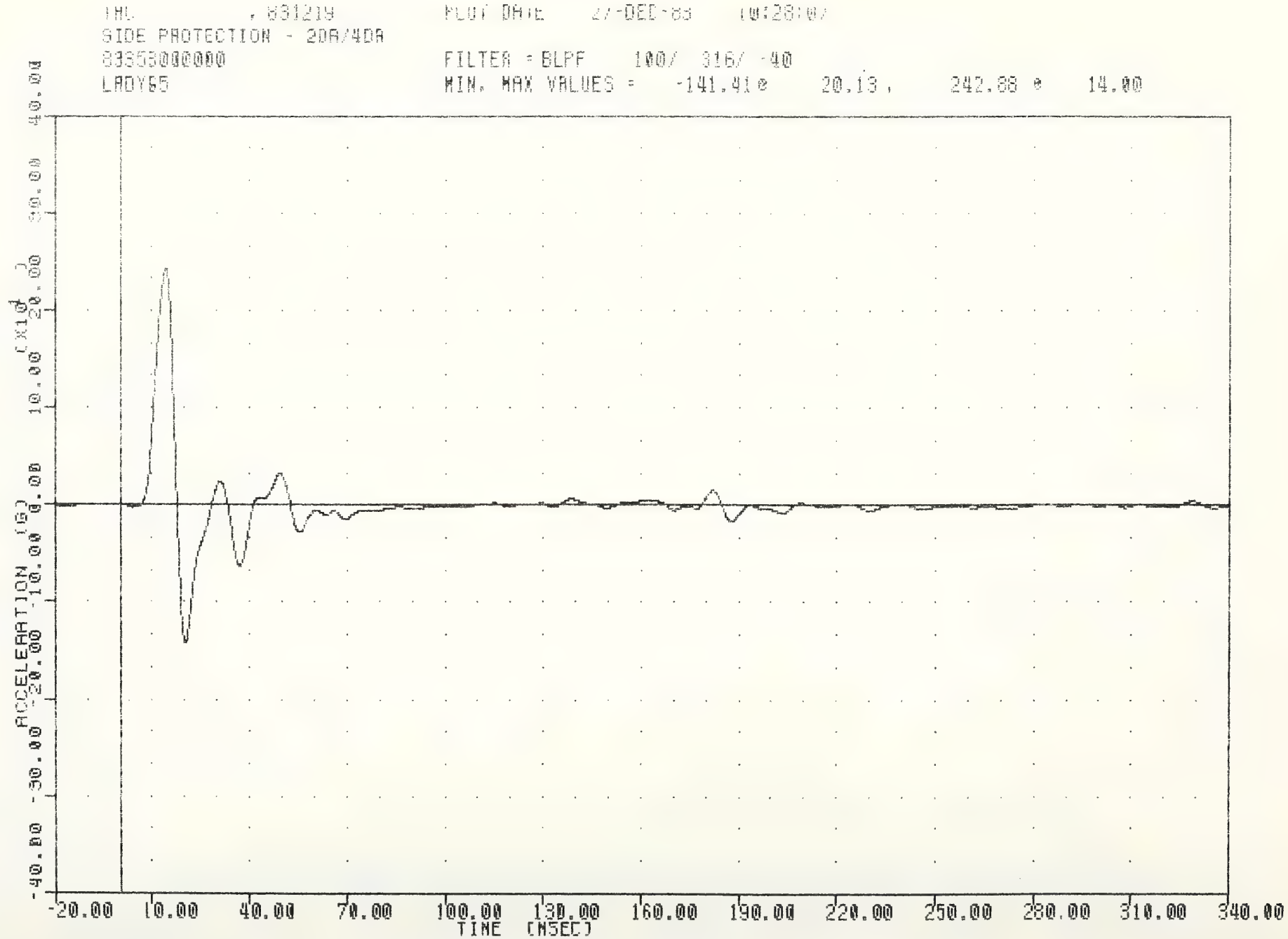
MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING LFDYG3



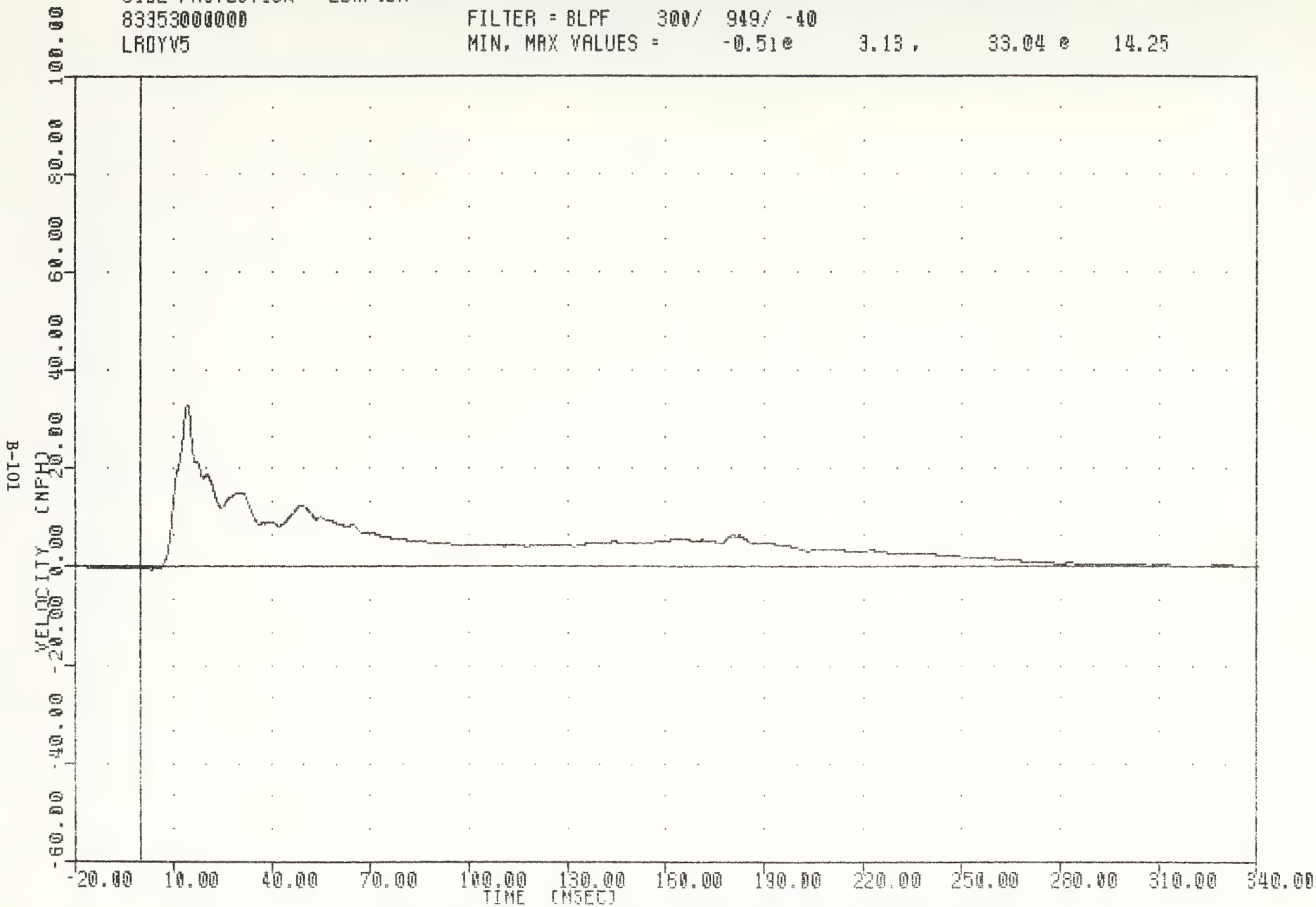
MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE LEFT REAR DOOR (POSITION 10) ACCELERATION Y AXIS



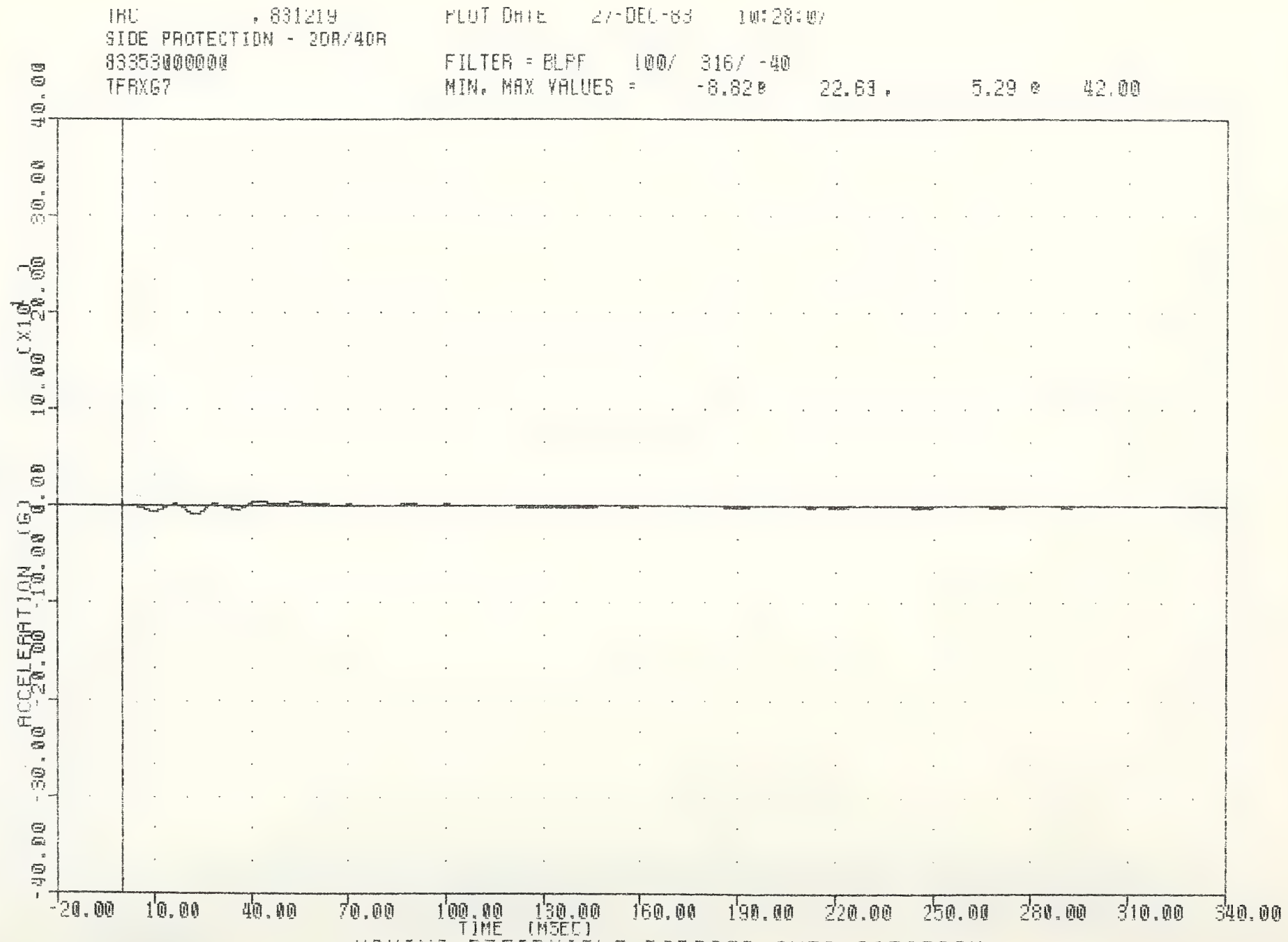
MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING LRDYG4



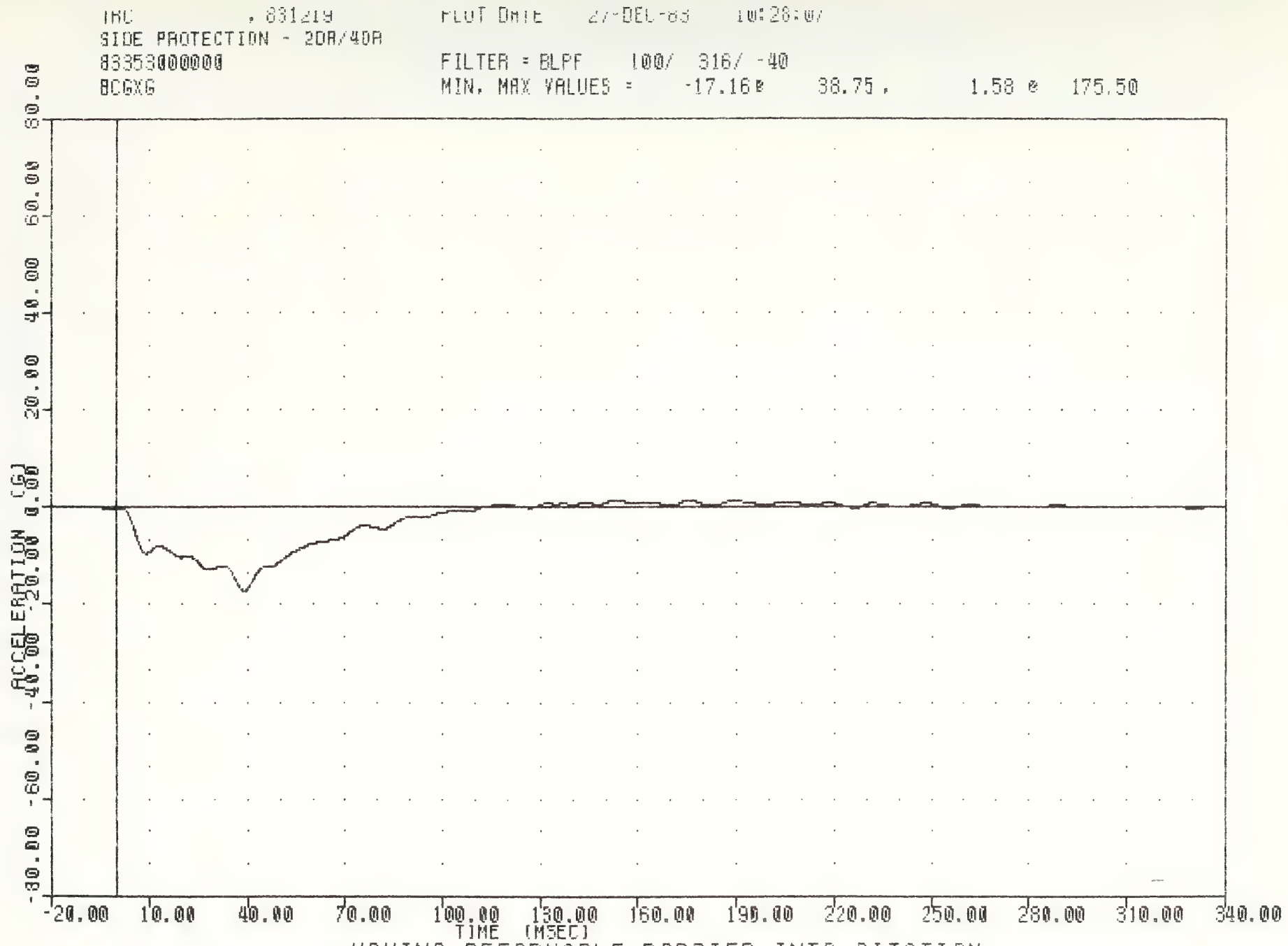
MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE LEFT REAR DOOR (POSITION 11) ACCELERATION Y AXIS



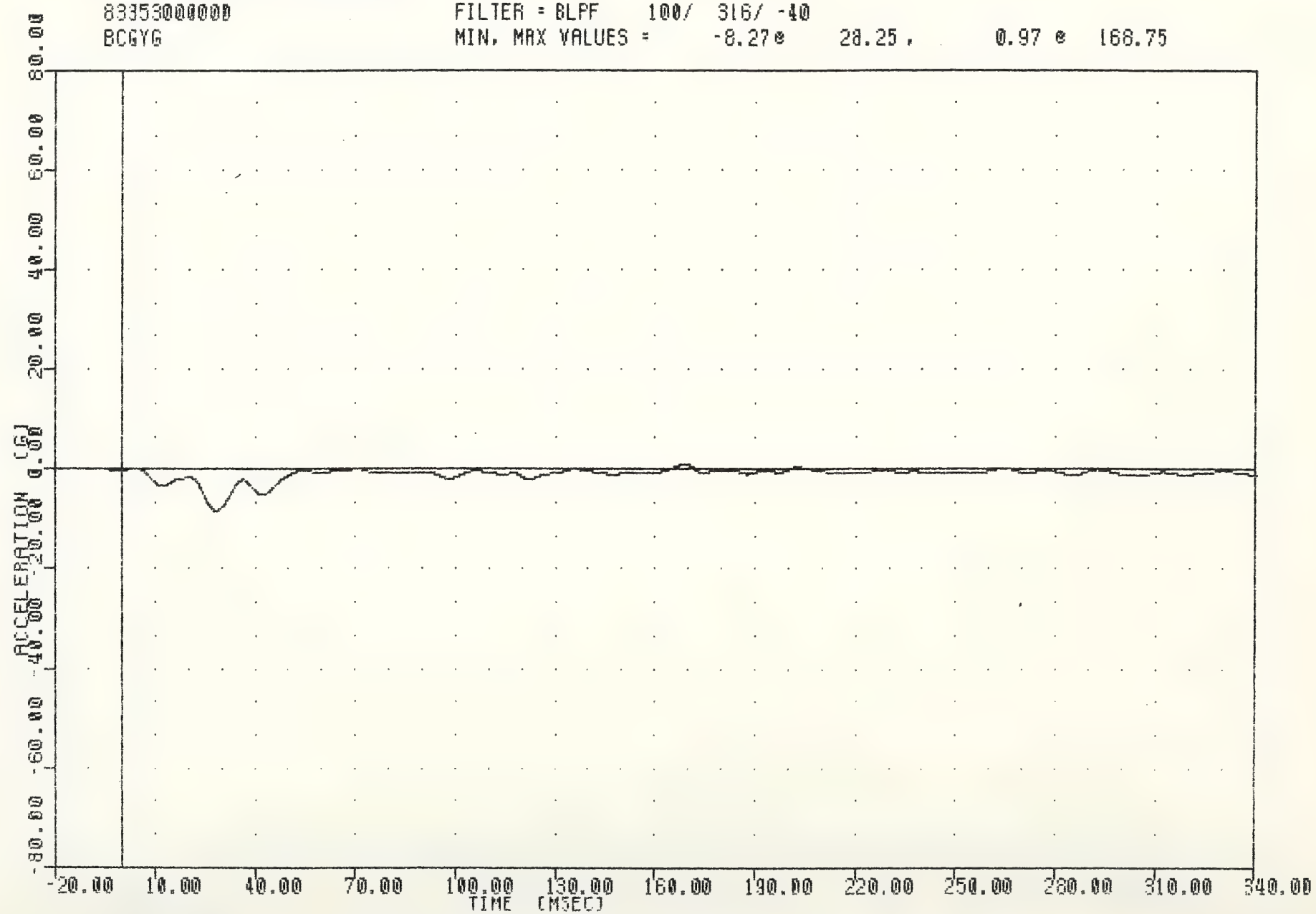
MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING LRDYV5



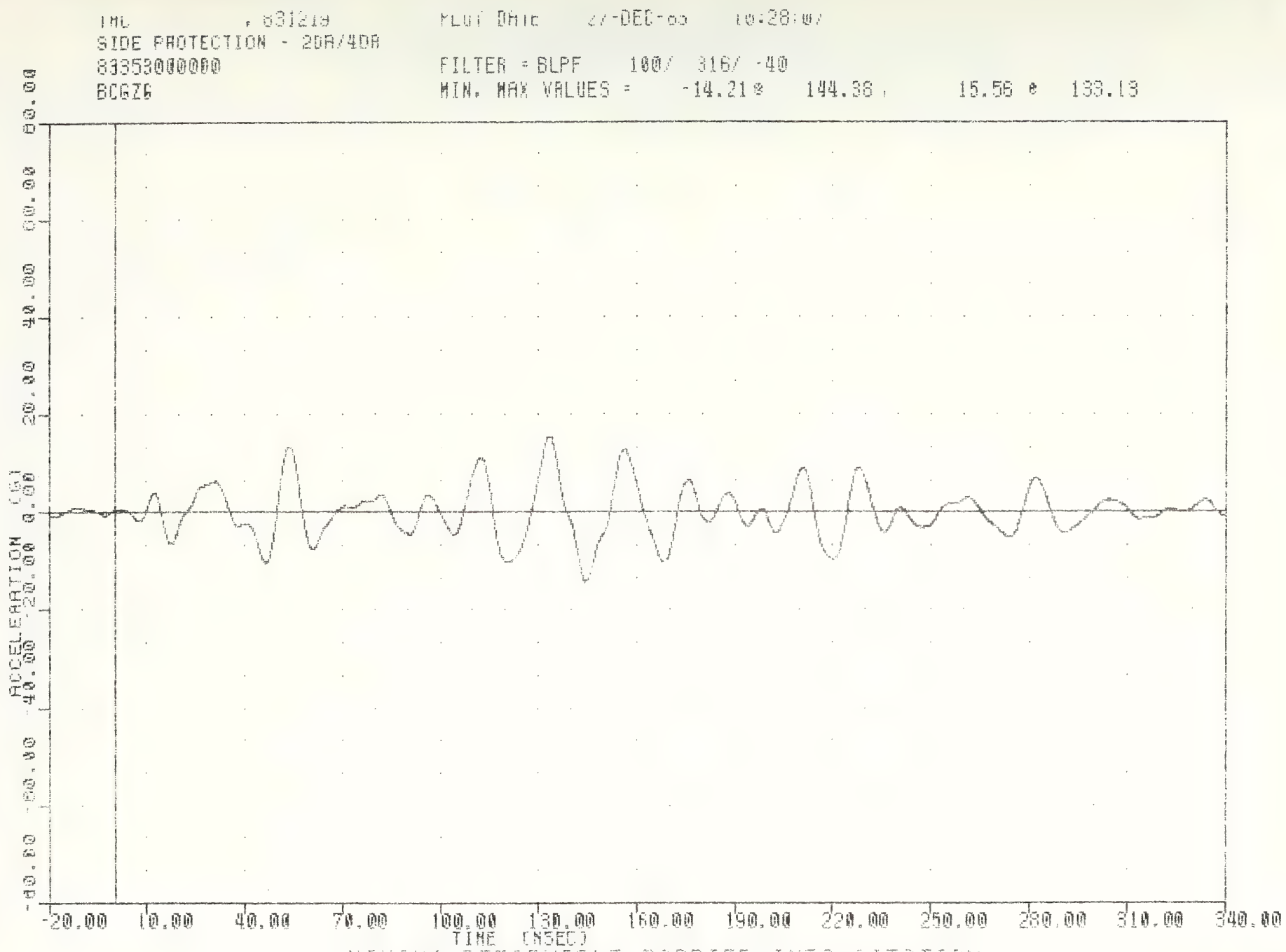
MOVING DEFORMABLE BARRIER INTO CITATION
VEHICLE TRUNK FLOOR RIGHT ACCELERATION X AXIS

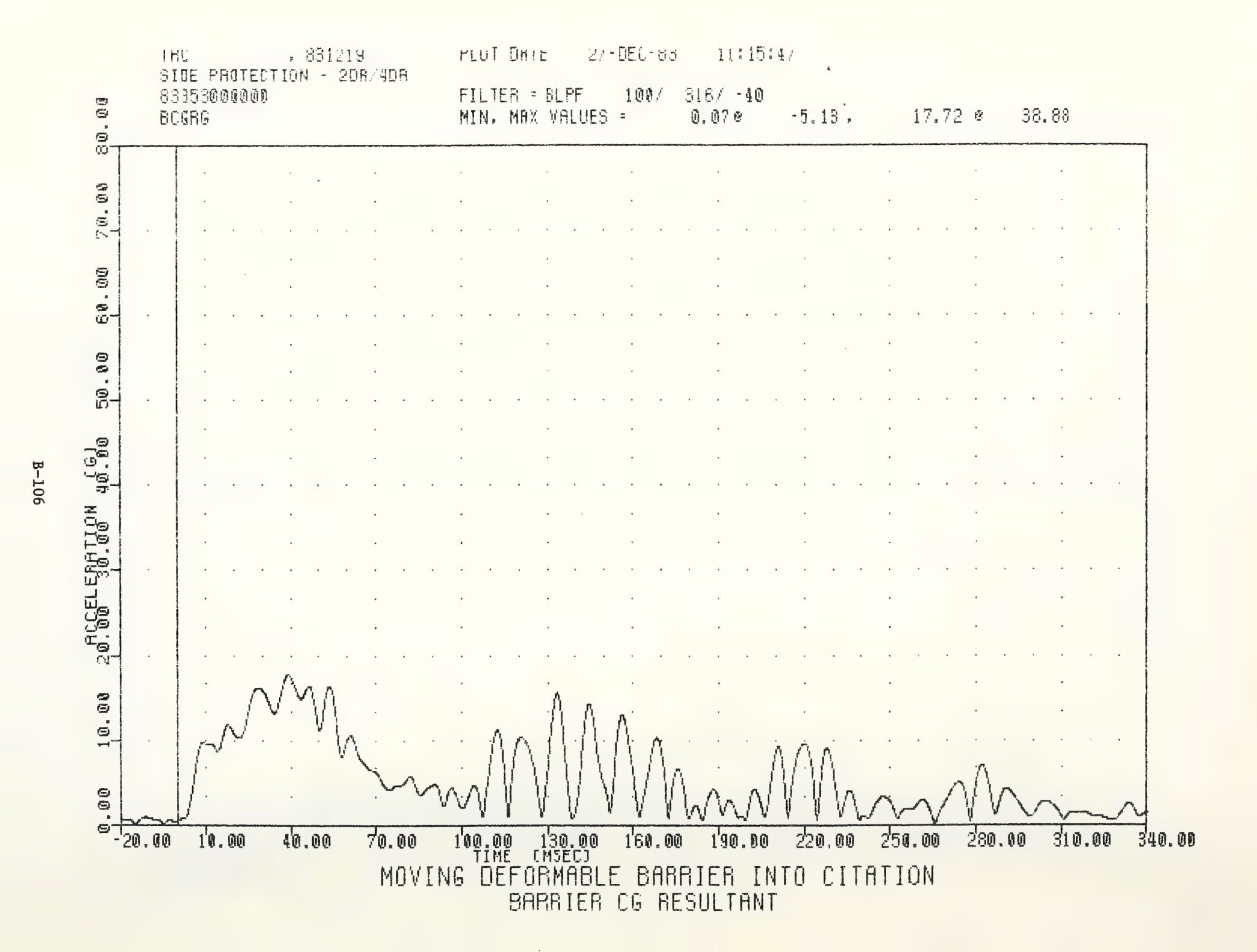


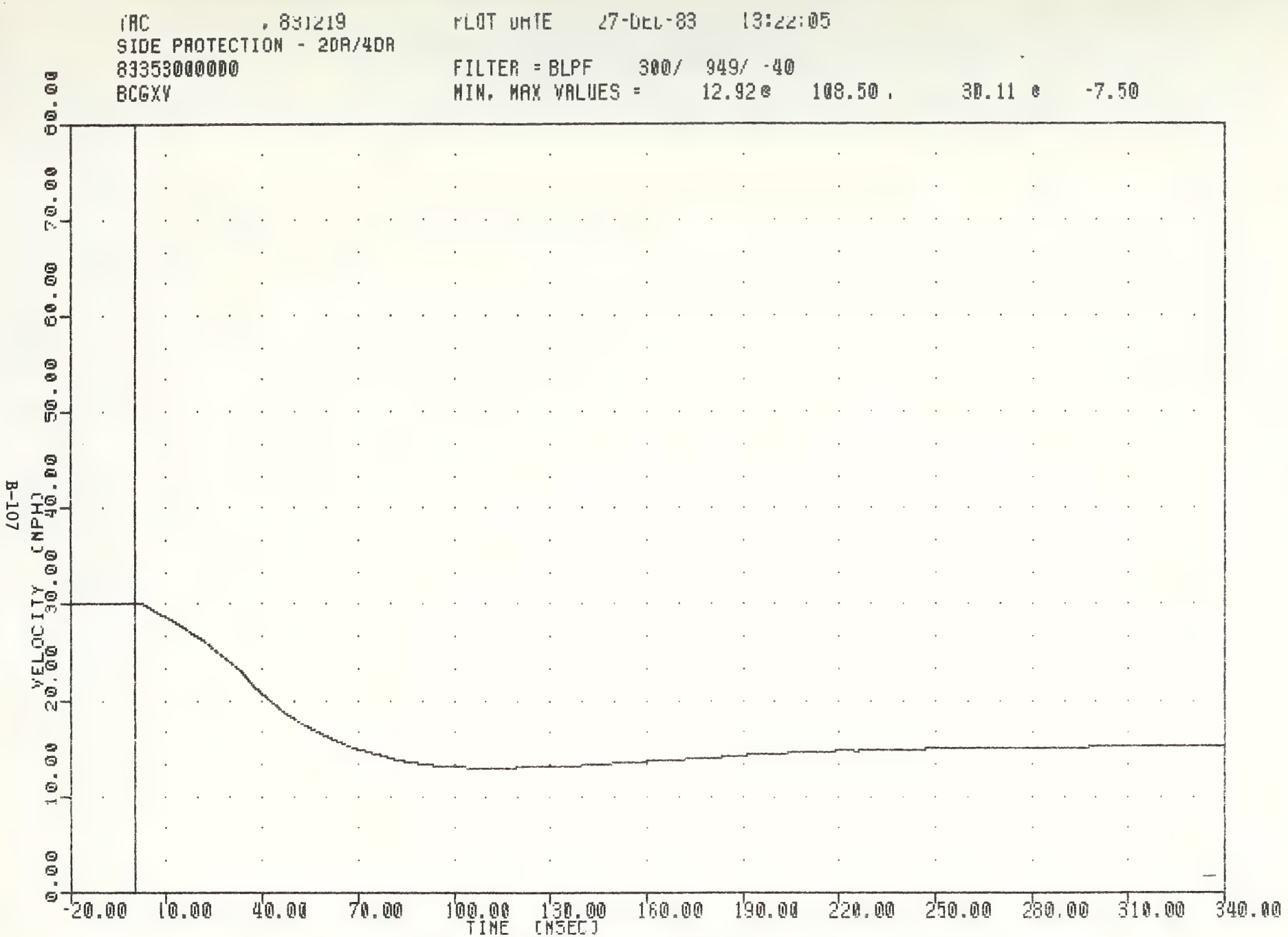
MOVING DEFORMABLE BARRIER INTO CITATION
BARRIER CENTER OF GRAVITY X AXIS



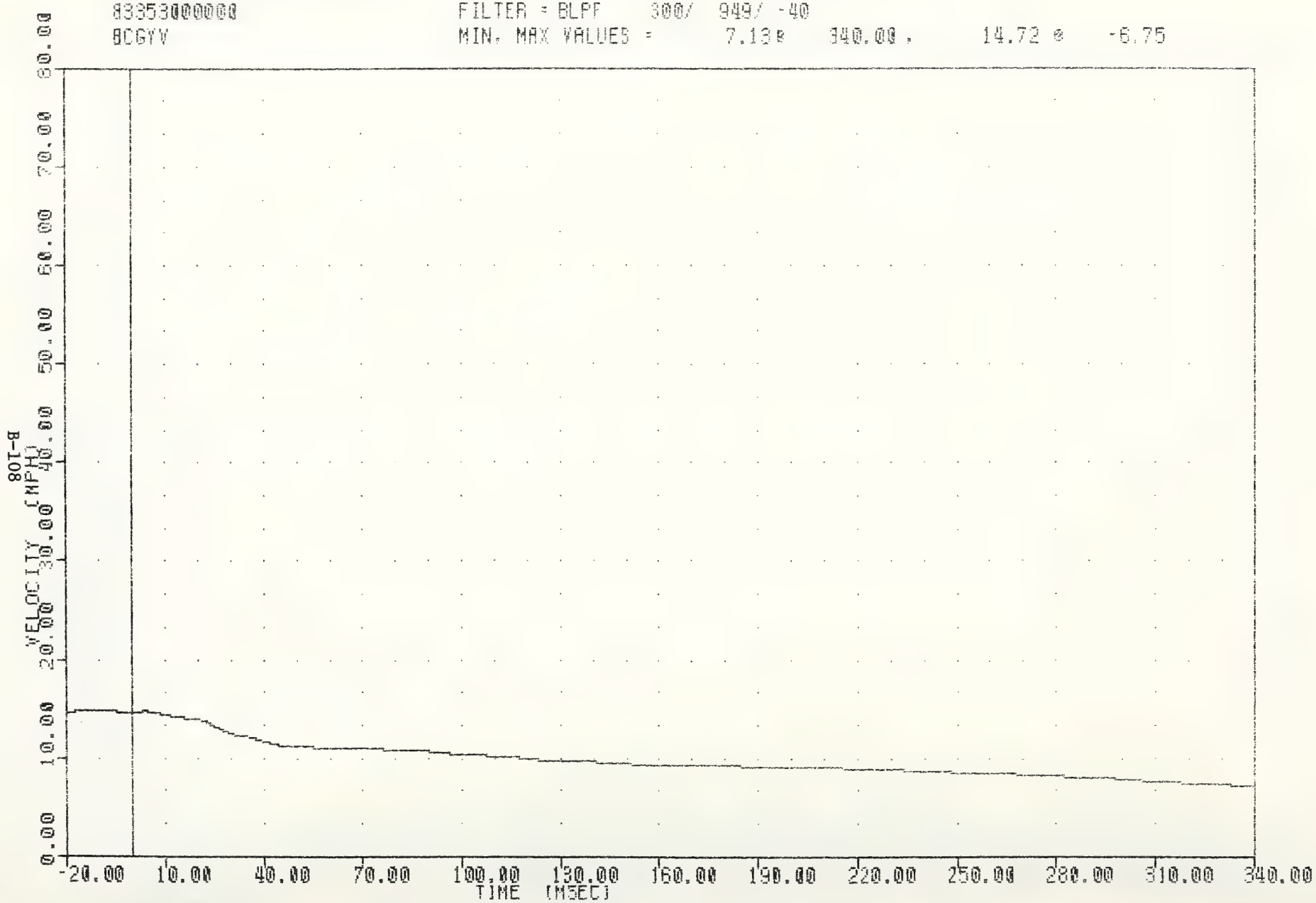
MOVING DEFORMABLE BARRIER INTO CITATION
BARRIER CENTER OF GRAVITY Y AXIS


IML , 031219
PLOT DATE 27-DEC-00 10:28:07
SIDE PROTECTION - 20R/4DR
83353000000
BCGZ6
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -14.21 @ 144.38 , 15.56 @ 133.13
ACCELERATION (G)
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO CITATION
BARRIER CENTER OF GRAVITY Z AXIS

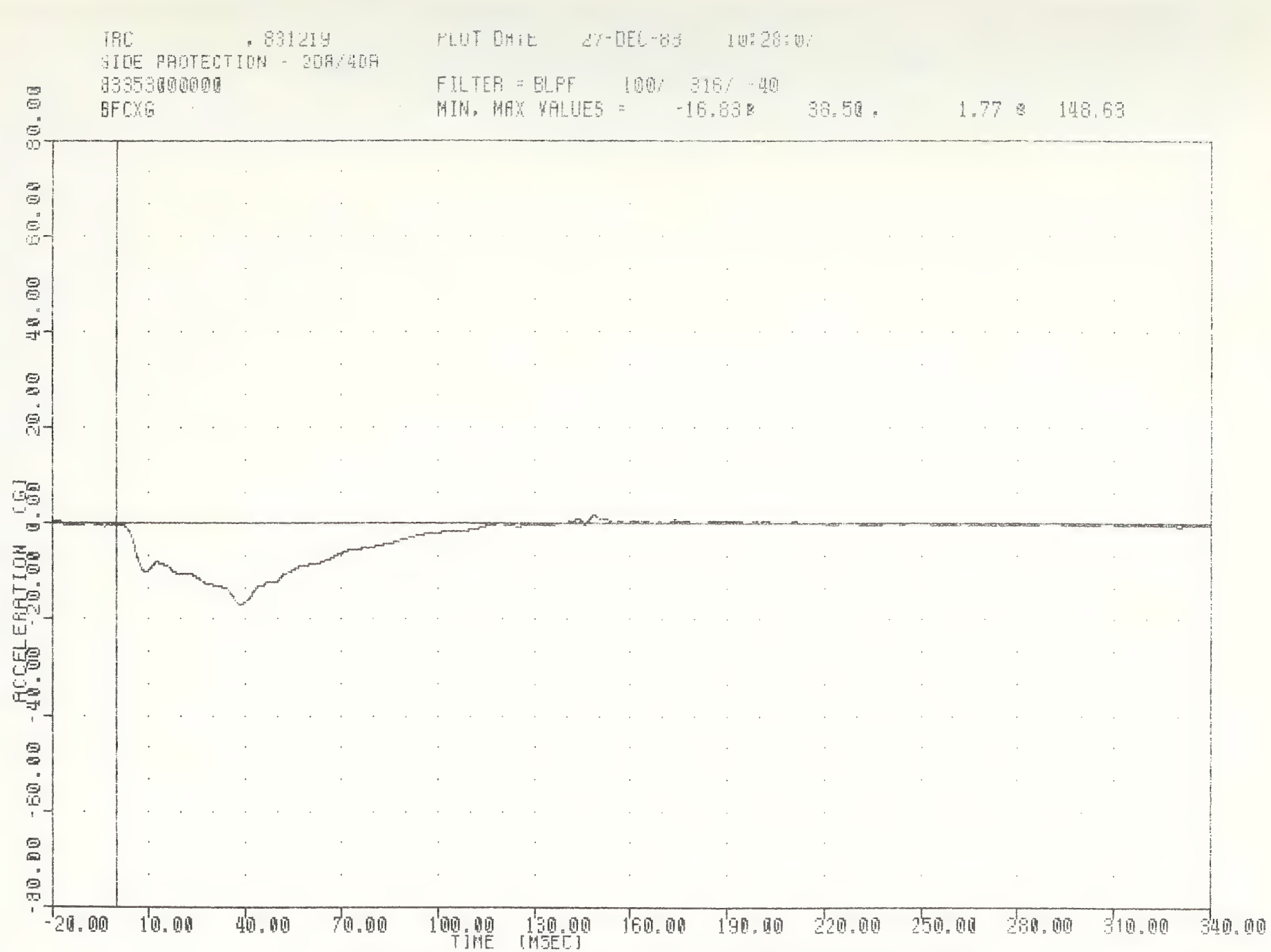

IHC , 831219
SIDE PROTECTION - 2DR/4DR
8335300@000
BCGRG
PLOT DATE 27-DEC-83 11:15:47
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = 0.07@ -5.13, 17.72 @ 38.88
ACCELERATION (G)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO CITATION
BARRIER CG RESULTANT



MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING BCGXG

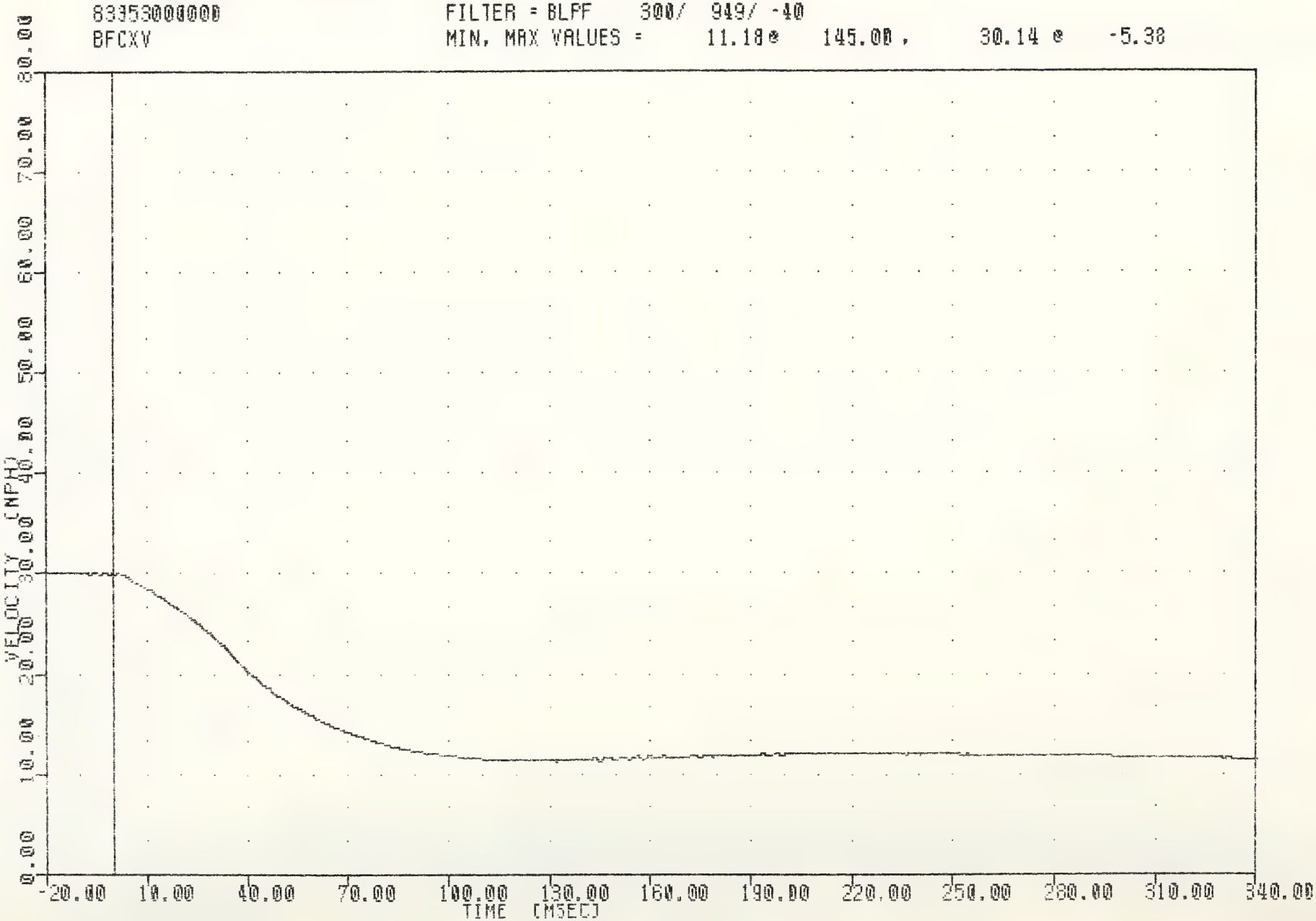


MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING BCGYS

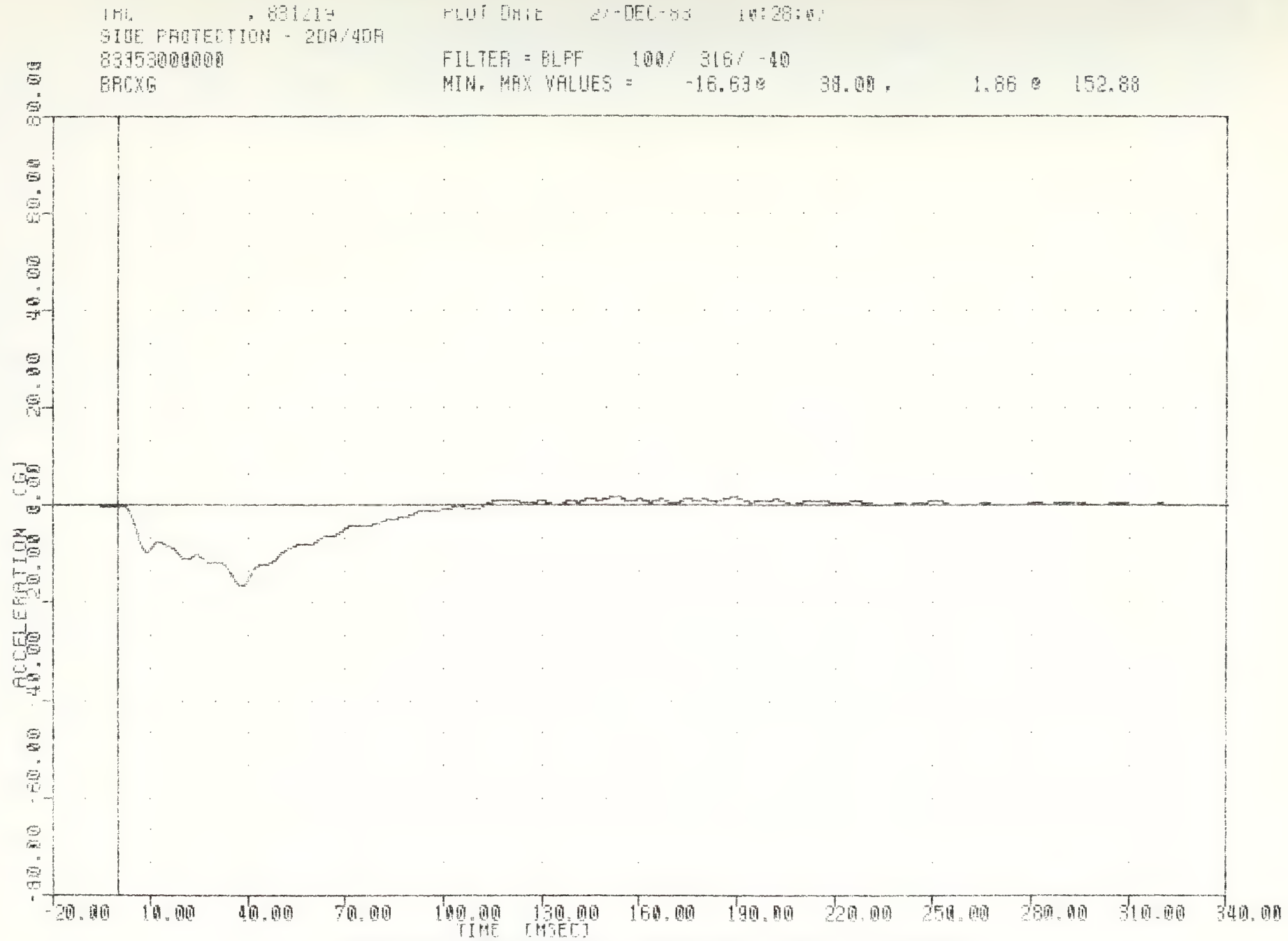


MOVING DEFORMABLE BARRIER INTO CITATION
BARRIER FRONT CROSSMEMBER ACCELERATION X AXIS

TRC 831219 PLOT DATE 27-DEC-83 13:22:05
SIDE PROTECTION - 2DR/4DR
833530000000 FILTER = BLPF 300/ 949/ -40
BFCXV MIN, MAX VALUES = 11.18 @ 145.00 , 30.14 @ -5.38



MOVING DEFORMABLE BARRIER INTO CITATION
DELTA V USING BFCXG

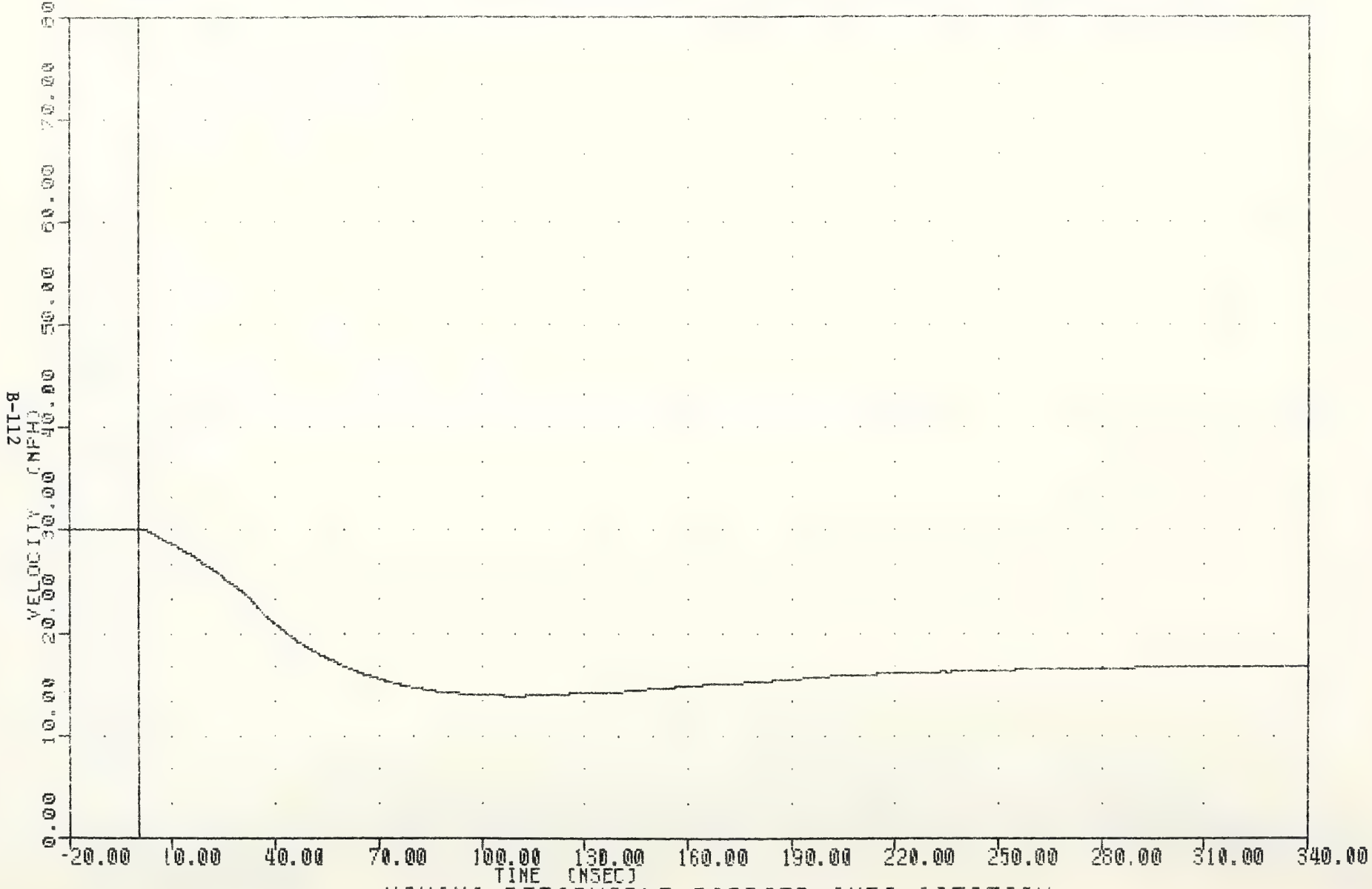

IML , 831219 PLOT DATE 27-DEC-83 14:28:07
SIDE PROTECTION - 2DR/4DR
83353000000
BRCXG
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -16.63@ 38.00 , 1.86 @ 152.88
80.00
60.00
40.00
20.00
0.00
-20.00
-40.00
-60.00
-80.00
ACCELERATION (G)
-20.00
10.00
40.00
70.00
100.00
130.00
160.00
190.00
220.00
250.00
280.00
310.00
340.00
TIME (MSEC)
MOVING DEFORMABLE BARRIER INTO CITATION
BARRIER REAR CROSSMEMBER ACCELERATION Y AXIS

IRC . 881219 PLOT UNIT 27-DEC-88 13:22:05

SIDE PROTECTION - 20A/40A

81353000000 FILTER = BLPF 300/ 949/ -40

BRCXV MIN, MAX VALUES = 13.80 @ 109.13 , 30.12 @ -7.50

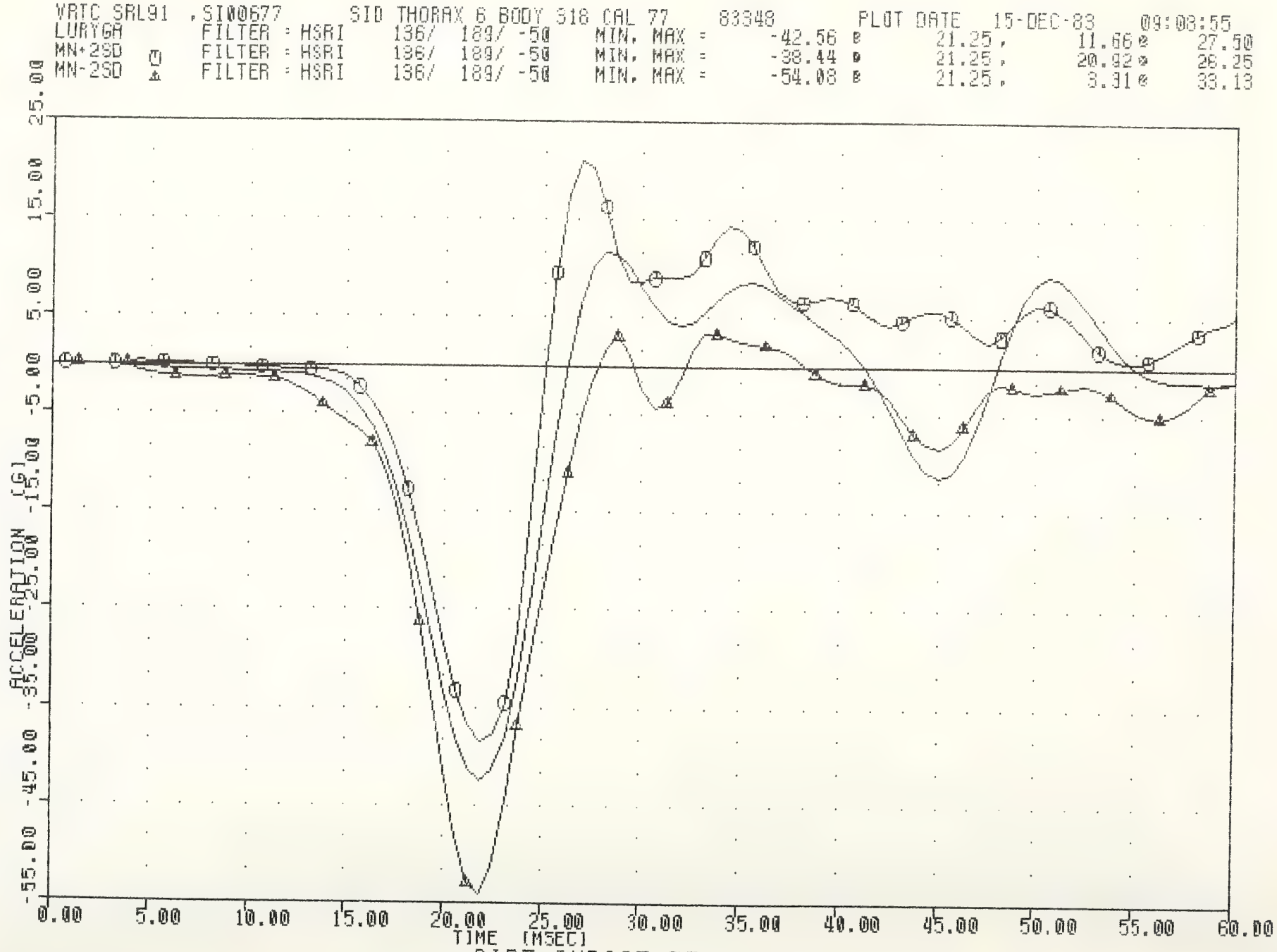


MOVING DEFORMABLE BARRIER INTO CITATION

DELTA V USING BRCXG

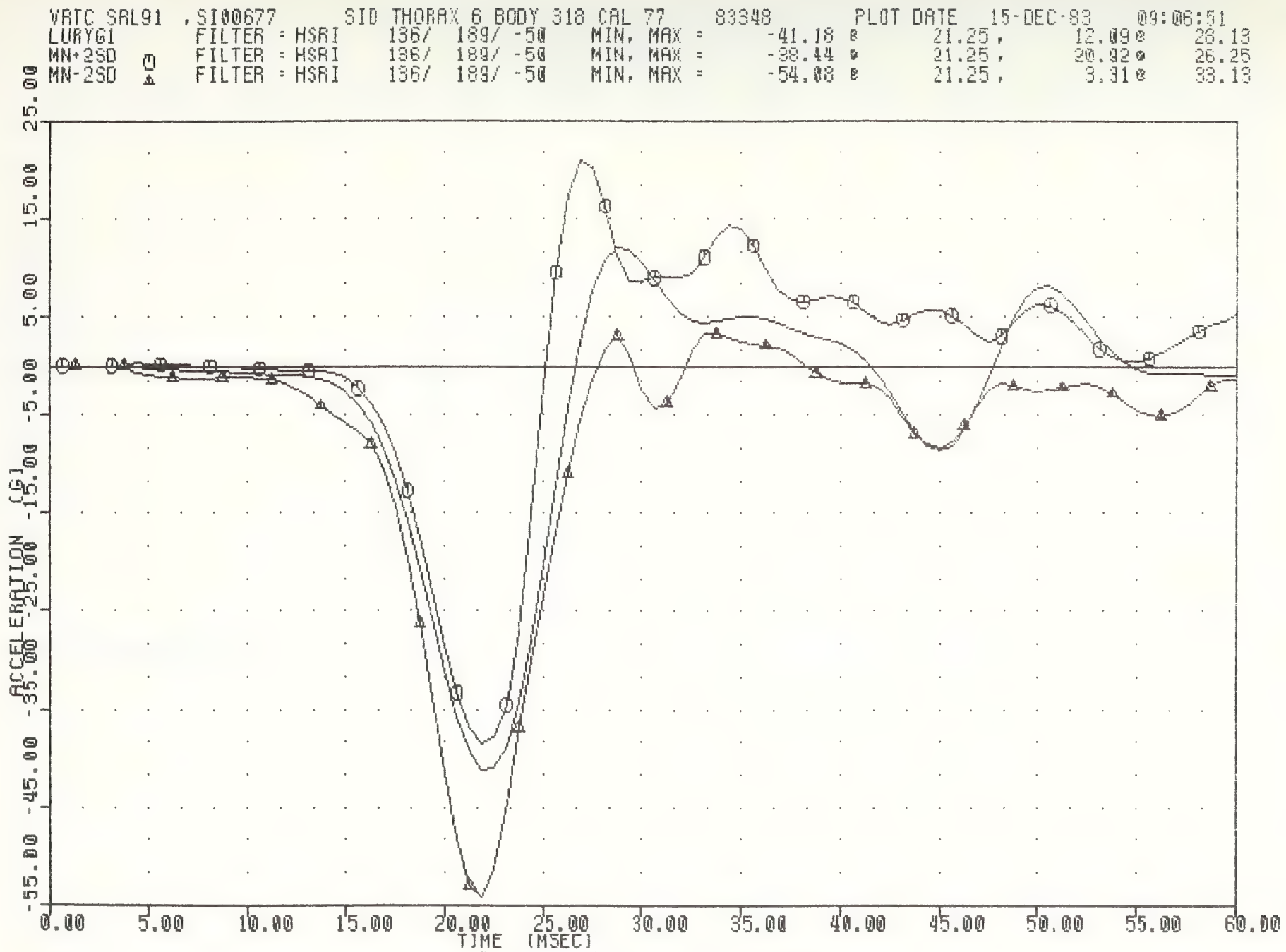
APPENDIX C

DUMMY CERTIFICATION



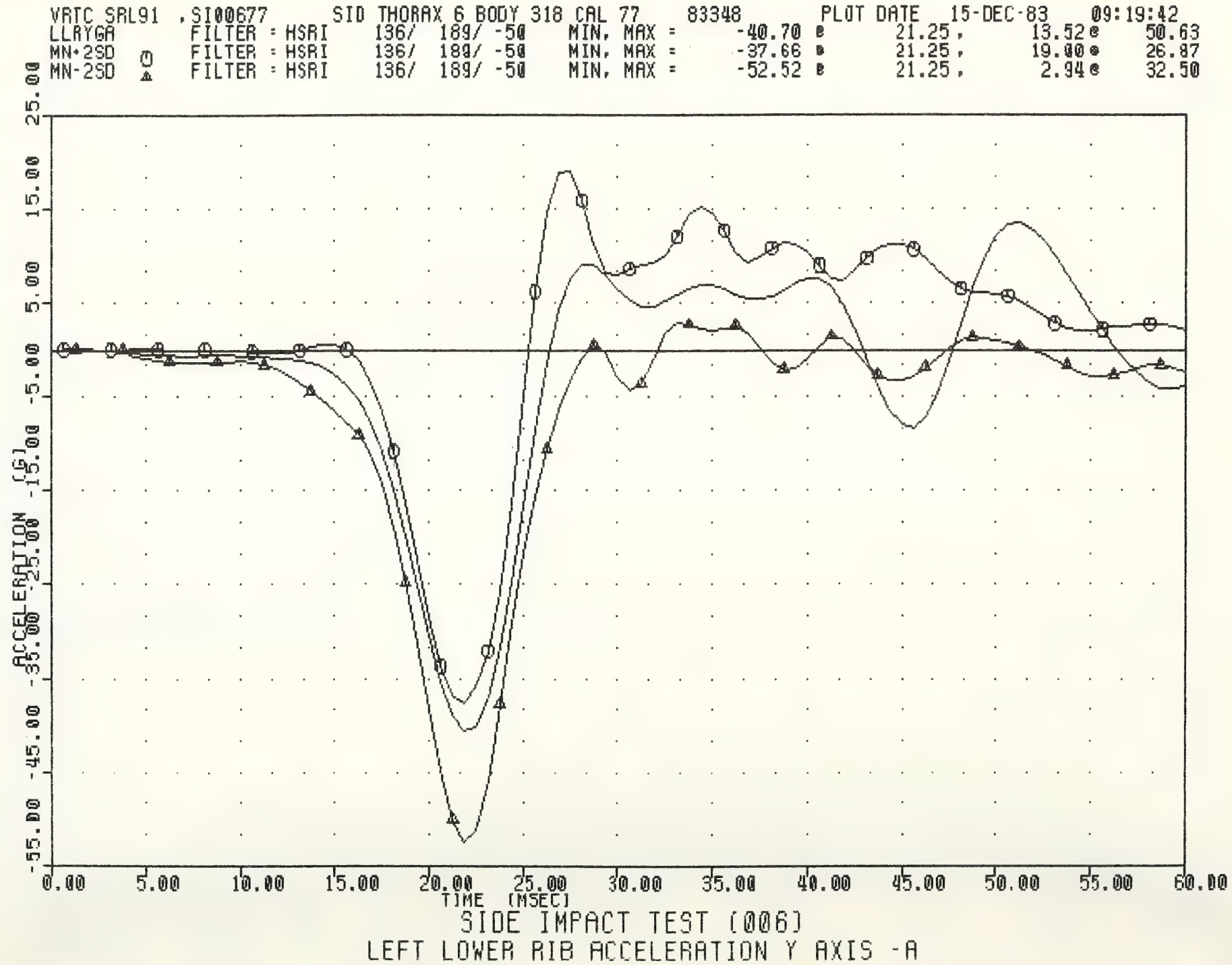
SIDE IMPACT TEST (006)

LEFT UPPER RIB ACCELERATION Y AXIS -A



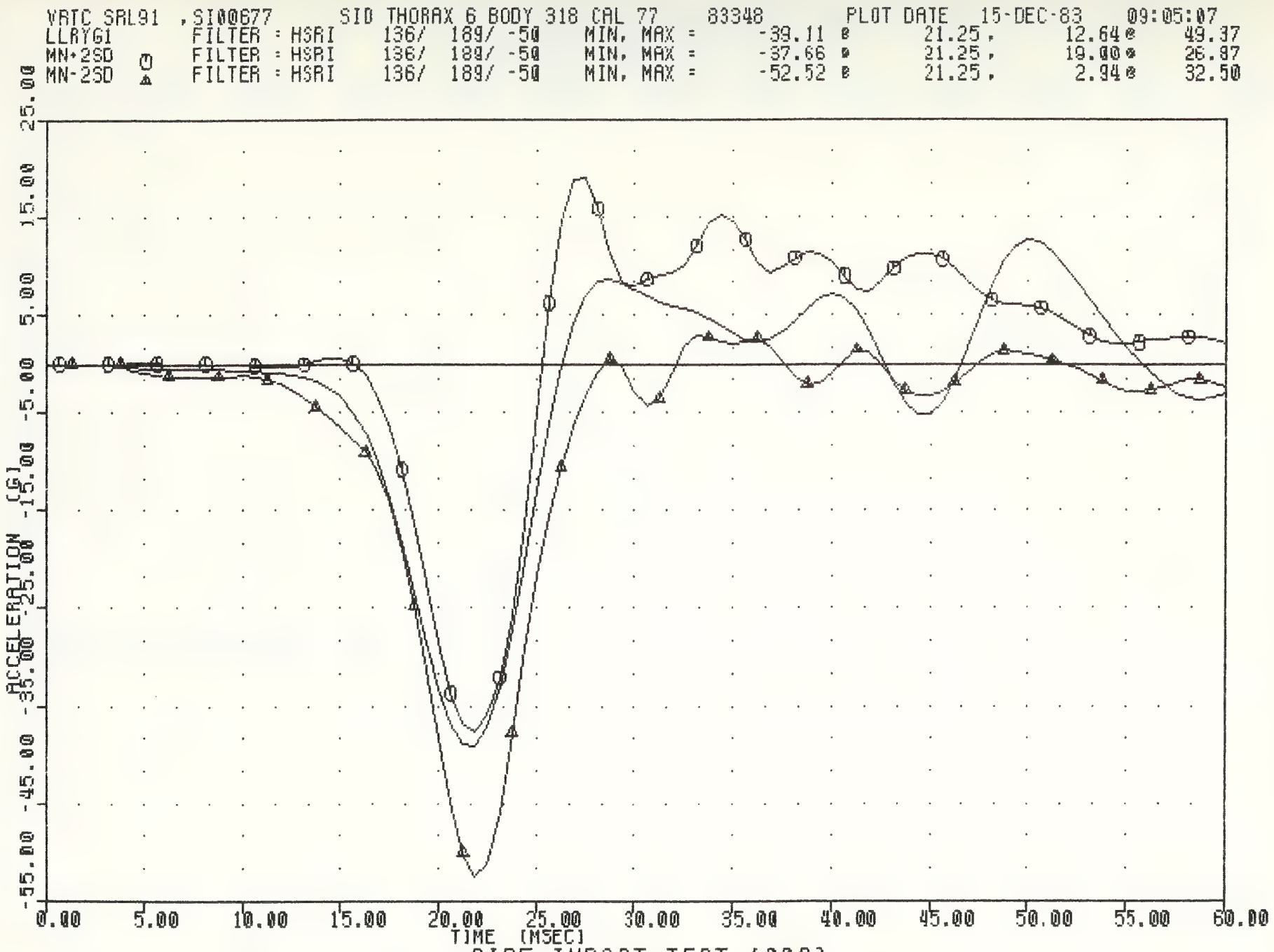
SIDE IMPACT TEST (006)

LEFT UPPER RIB ACCELERATION Y AXIS -1



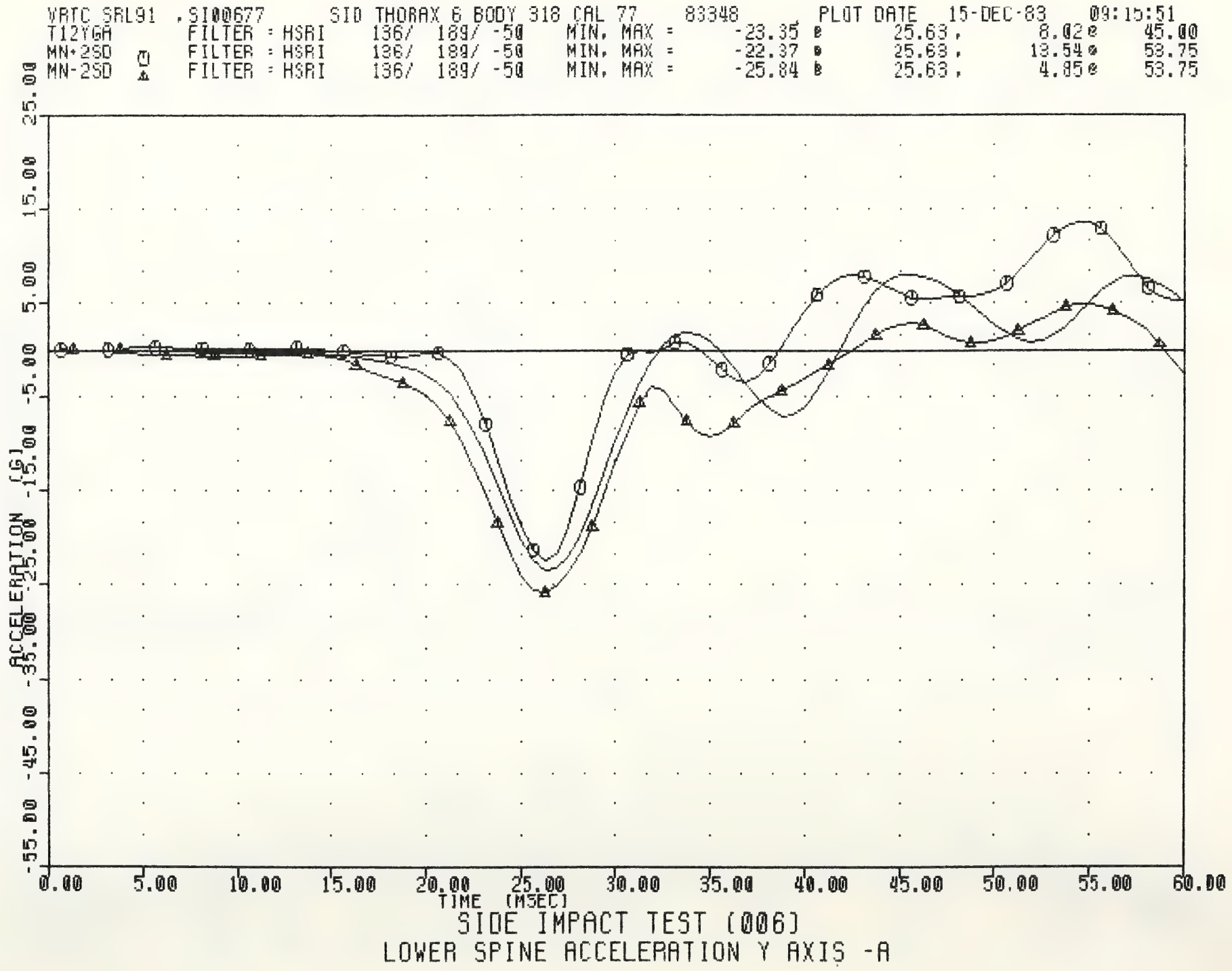
SIDE IMPACT TEST (006)

LEFT LOWER RIB ACCELERATION Y AXIS -A



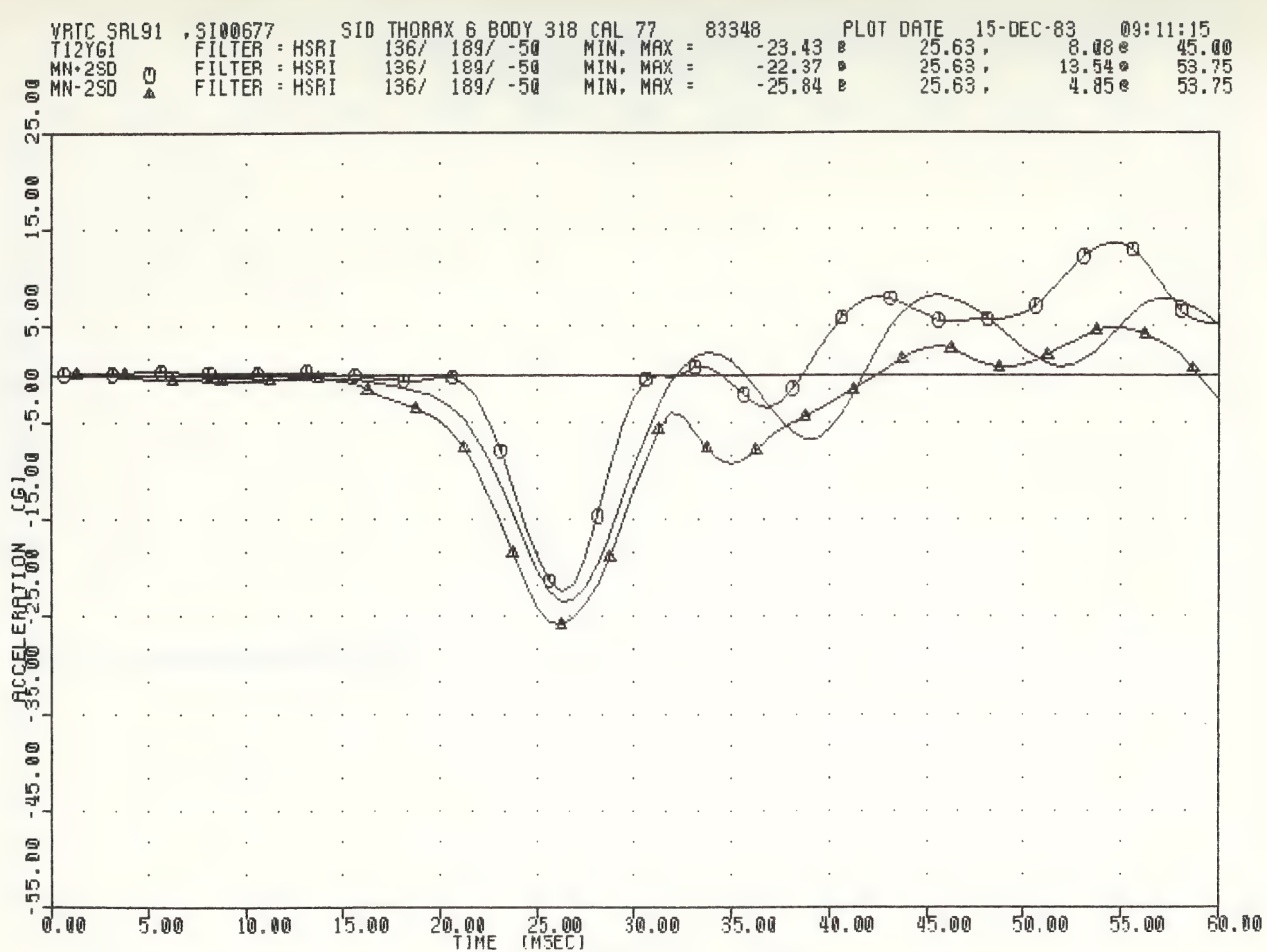
SIDE IMPACT TEST (006)

LEFT LOWER RIB ACCELERATION Y AXIS -1



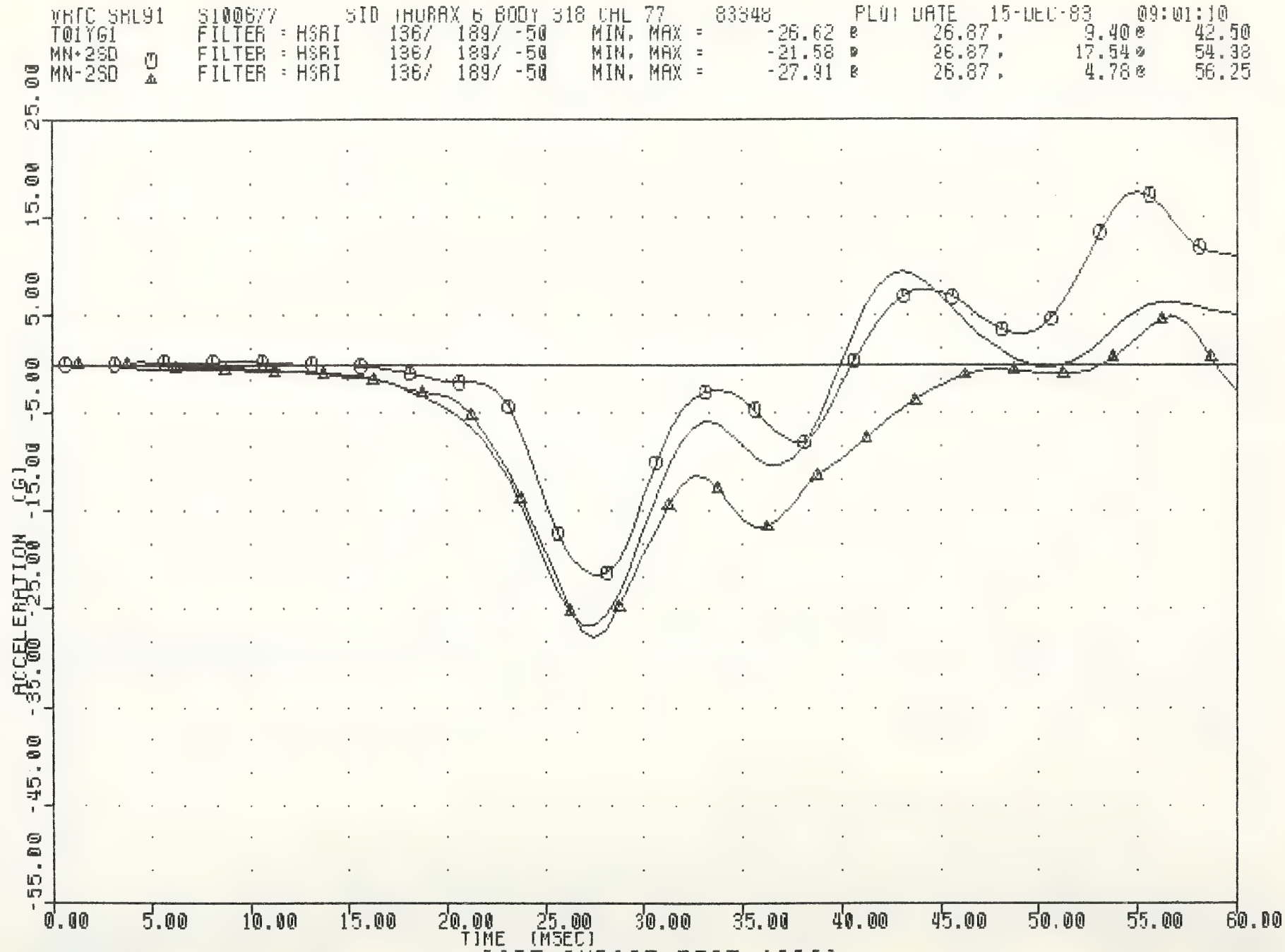
SIDE IMPACT TEST (006)

LOWER SPINE ACCELERATION Y AXIS -A



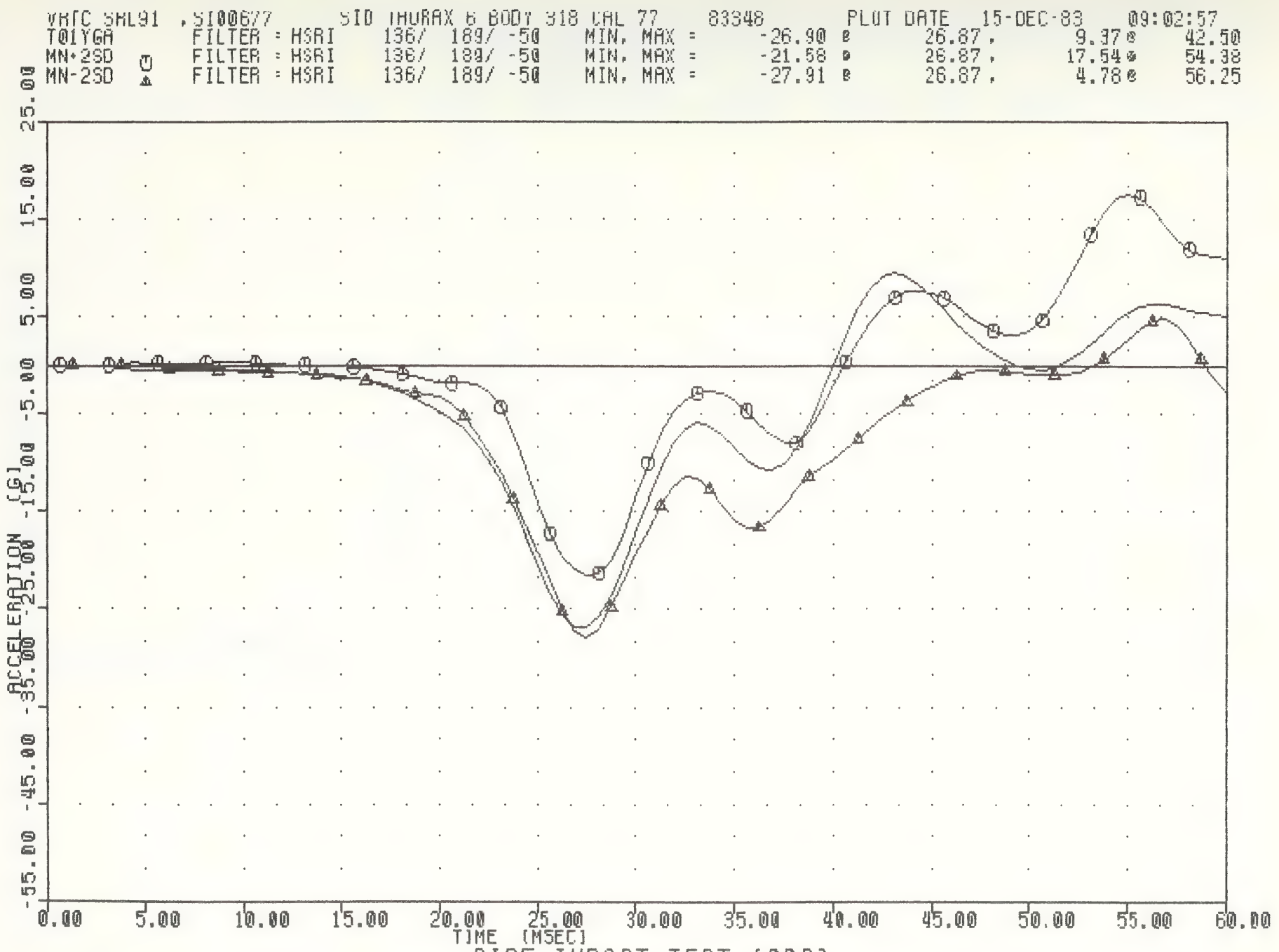
SIDE IMPACT TEST (006)

LOWER SPINE ACCELERATION Y AXIS -1



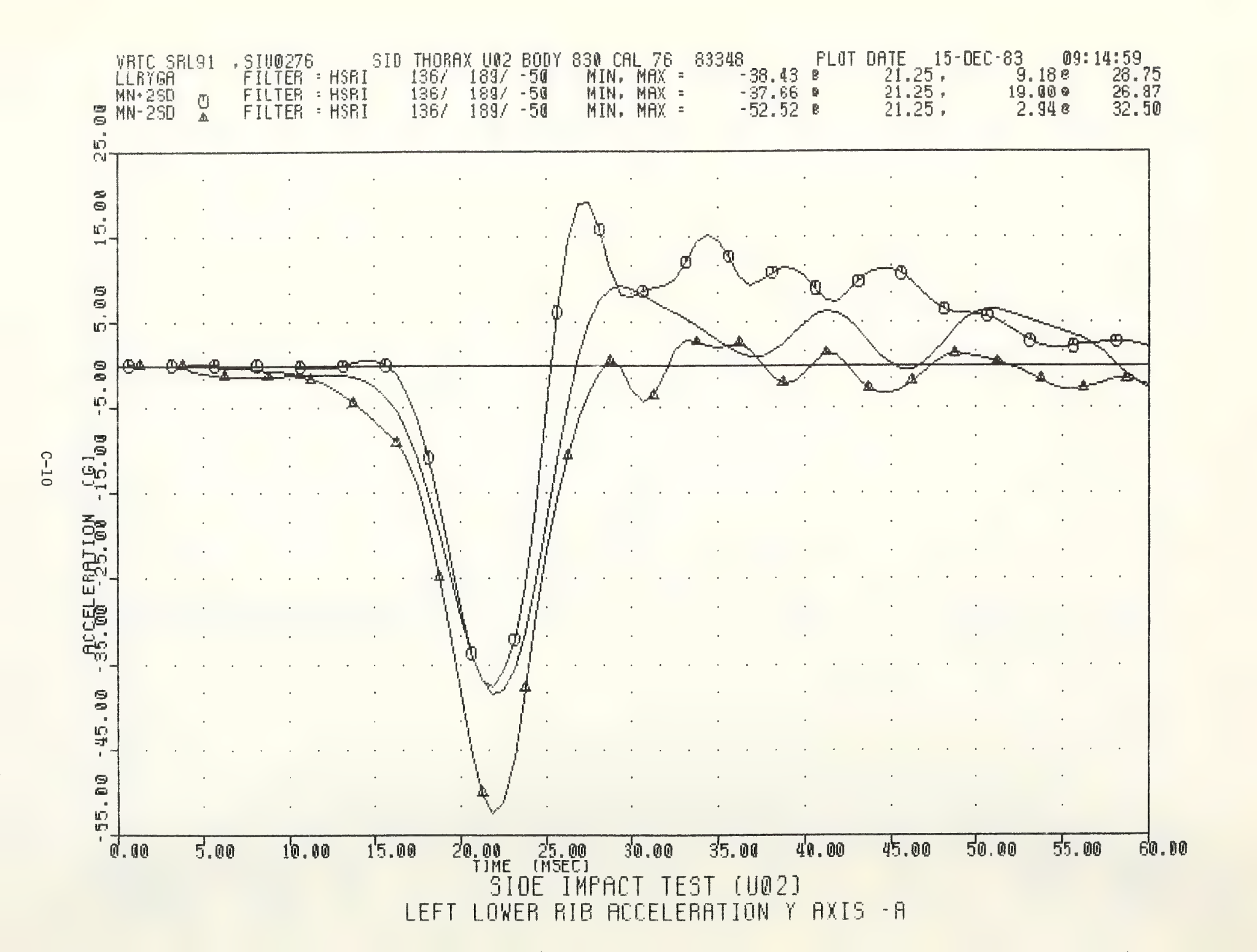
SIDE IMPACT TEST (006)

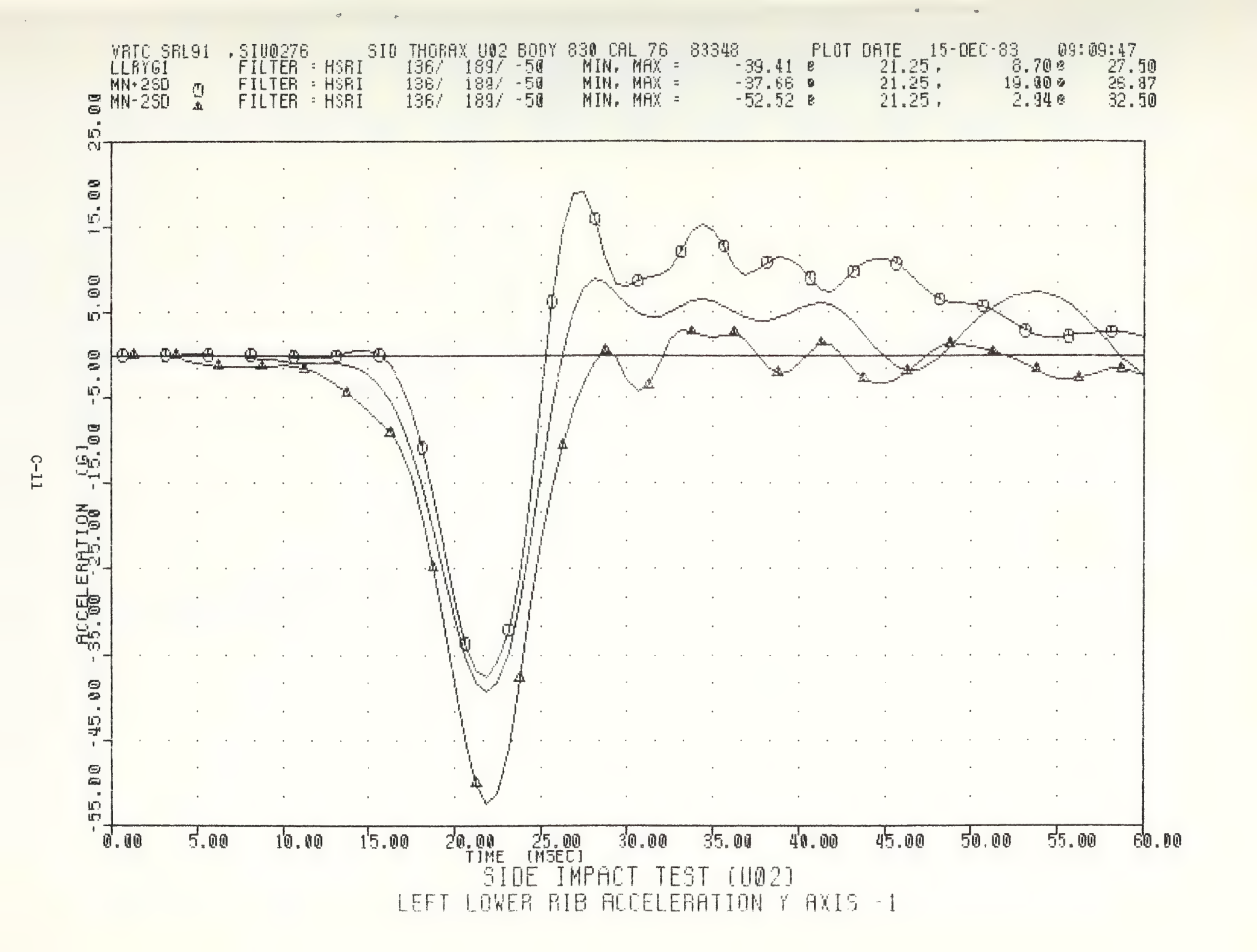
UPPER SPINE ACCELERATION Y AXIS -1

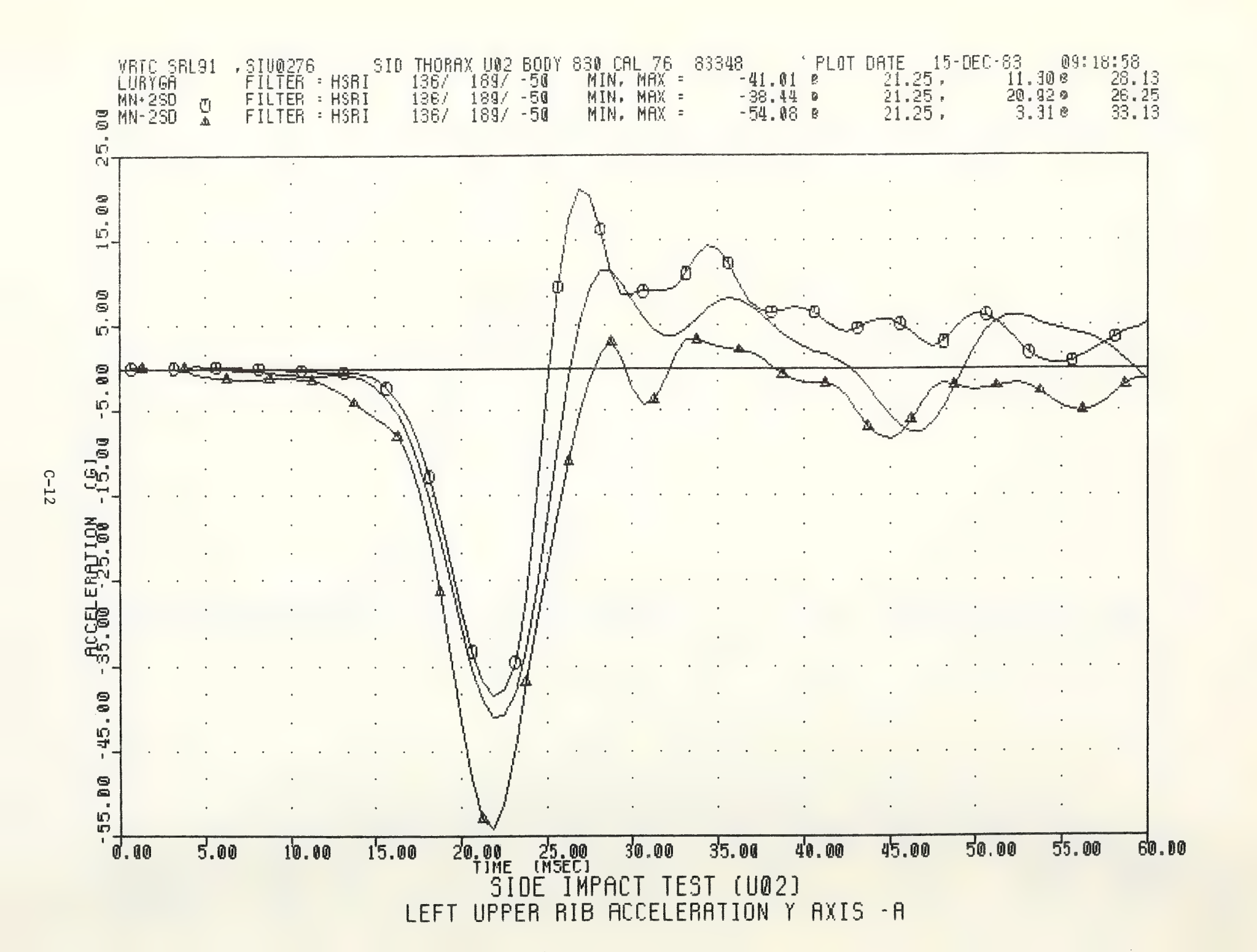


SIDE IMPACT TEST (006)

UPPER SPINE ACCELERATION Y AXIS -A

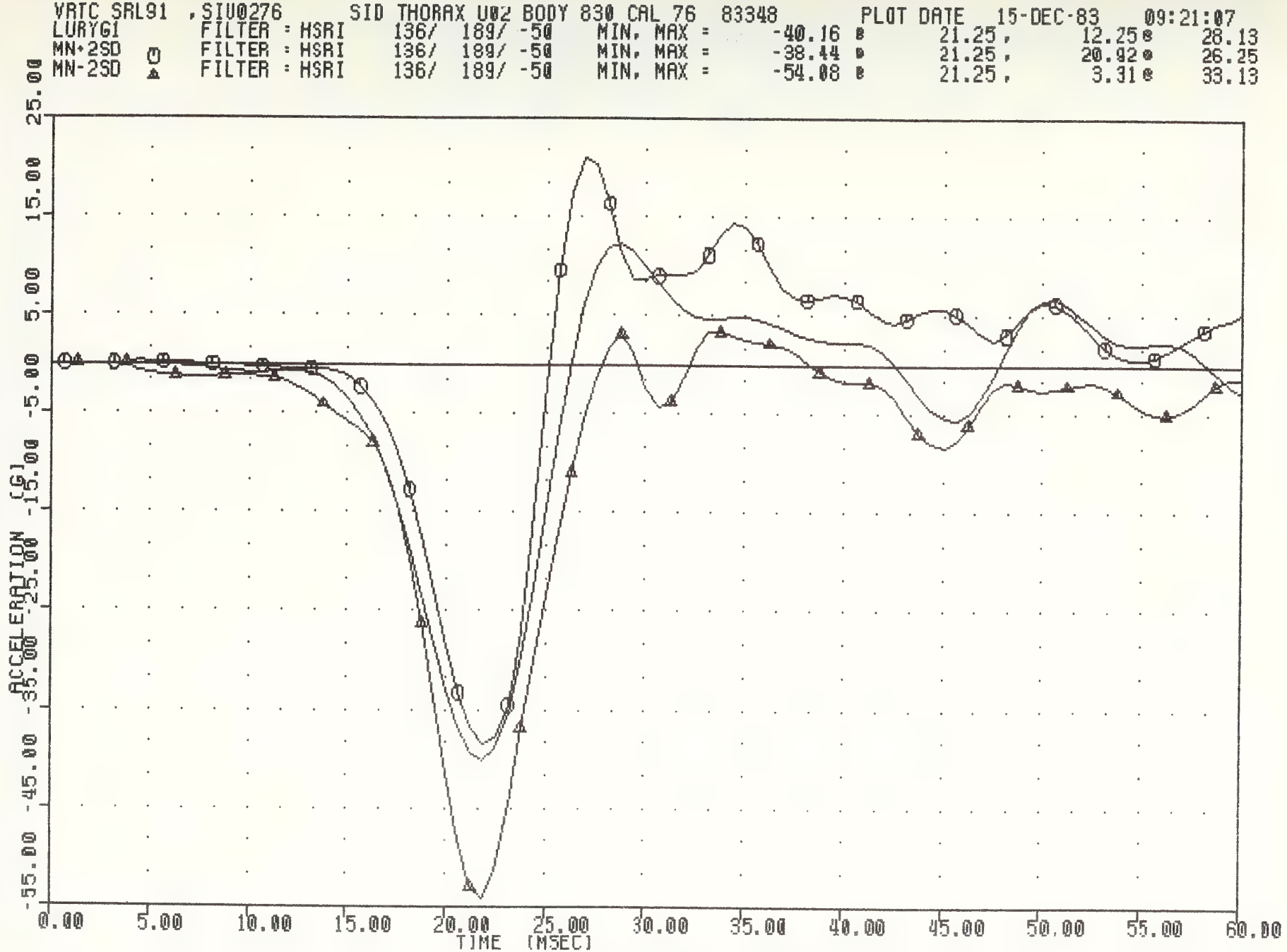

VRTC SRL91 ,SIU0276 SID THORAX U02 BODY 830 CAL 76 83348 PLOT DATE 15-DEC-83 09:14:59
LLRYGA FILTER : HSRI 136/ 189/ -50 MIN, MAX = -38.43 @ 21.25 , 9.18 @ 28.75
MN+2SD FILTER : HSRI 136/ 189/ -50 MIN, MAX = -37.66 @ 21.25 , 19.00 @ 26.87
MN-2SD FILTER : HSRI 136/ 189/ -50 MIN, MAX = -52.52 @ 21.25 , 2.94 @ 32.50
ACCELERATION (G)
25.00
15.00
5.00
-5.00
-15.00
-25.00
-35.00
-45.00
-55.00
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
55.00
60.00
TIME (MSEC)
SIDE IMPACT TEST (U02)
LEFT LOWER RIB ACCELERATION Y AXIS -A


VRTC SRL91 ,SIU0276 SID THORAX U02 BODY 830 CAL 76 83348 PLOT DATE 15-DEC-83 09:09:47
LLRYGI FILTER = HSRI 136/ 189/ -50 MIN, MAX = -39.41 @ 21.25 , 8.70 @ 27.50
MN+2SD FILTER = HSRI 136/ 189/ -50 MIN, MAX = -37.66 @ 21.25 , 19.00 @ 26.87
MN-2SD FILTER = HSRI 136/ 189/ -50 MIN, MAX = -52.52 @ 21.25 , 2.94 @ 32.50
25.00
15.00
5.00
-5.00
-15.00
-25.00
-35.00
-45.00
-55.00
ACCELERATION (G)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
55.00
60.00
TIME (MSEC)
SIDE IMPACT TEST (U02)
LEFT LOWER RIB ACCELERATION Y AXIS -1



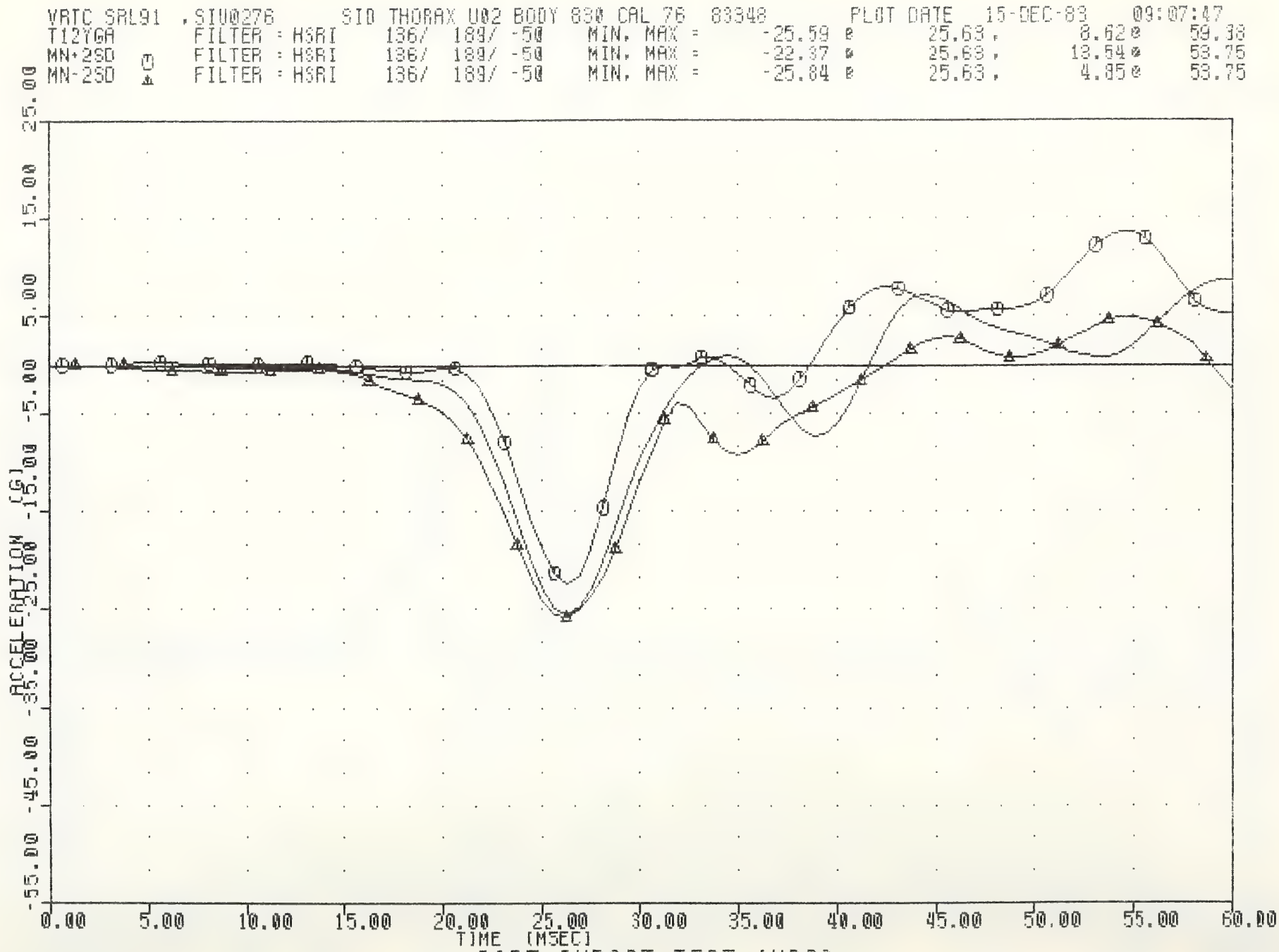
SIDE IMPACT TEST (U02)

LEFT UPPER RIB ACCELERATION Y AXIS -A



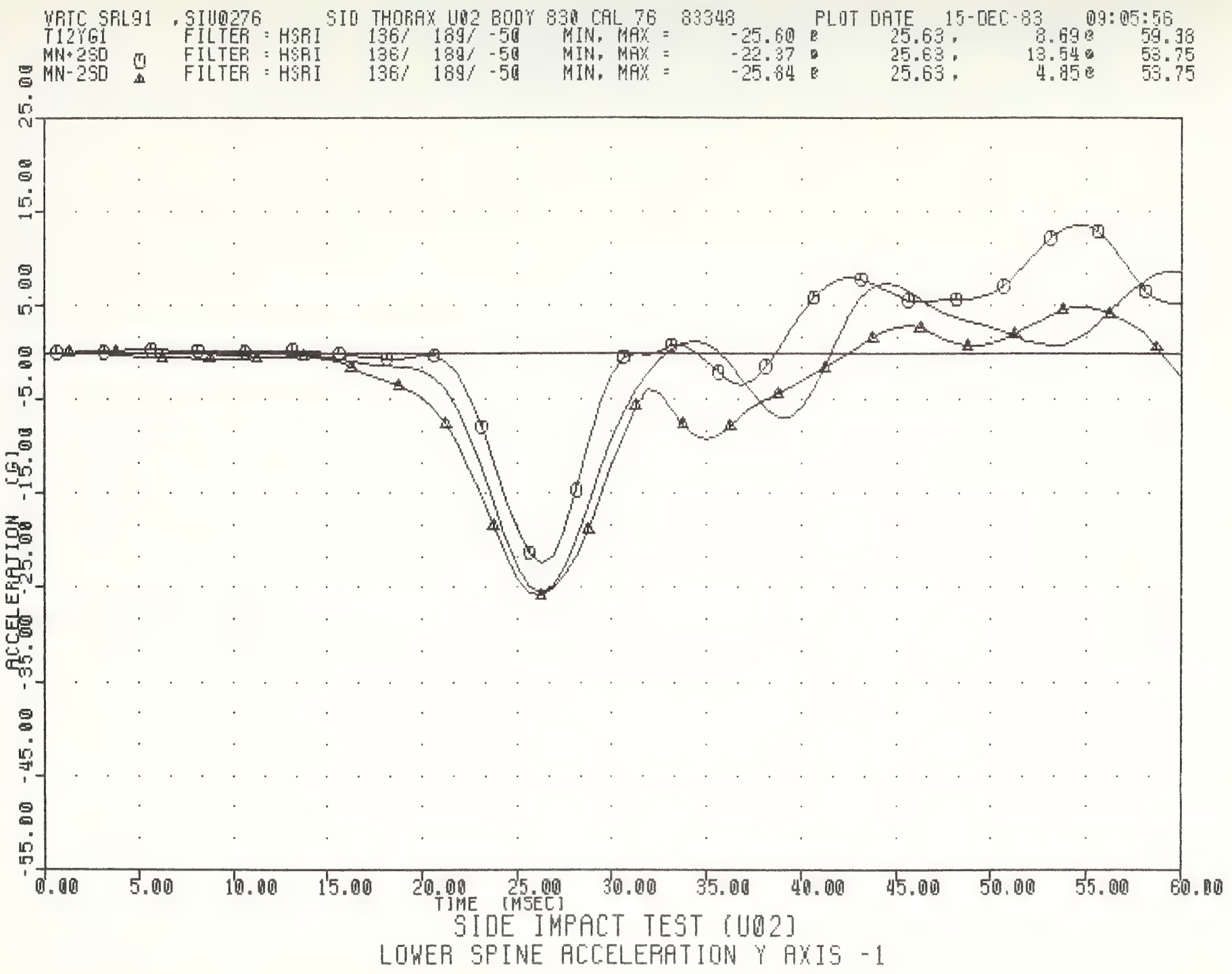
SIDE IMPACT TEST (U02)

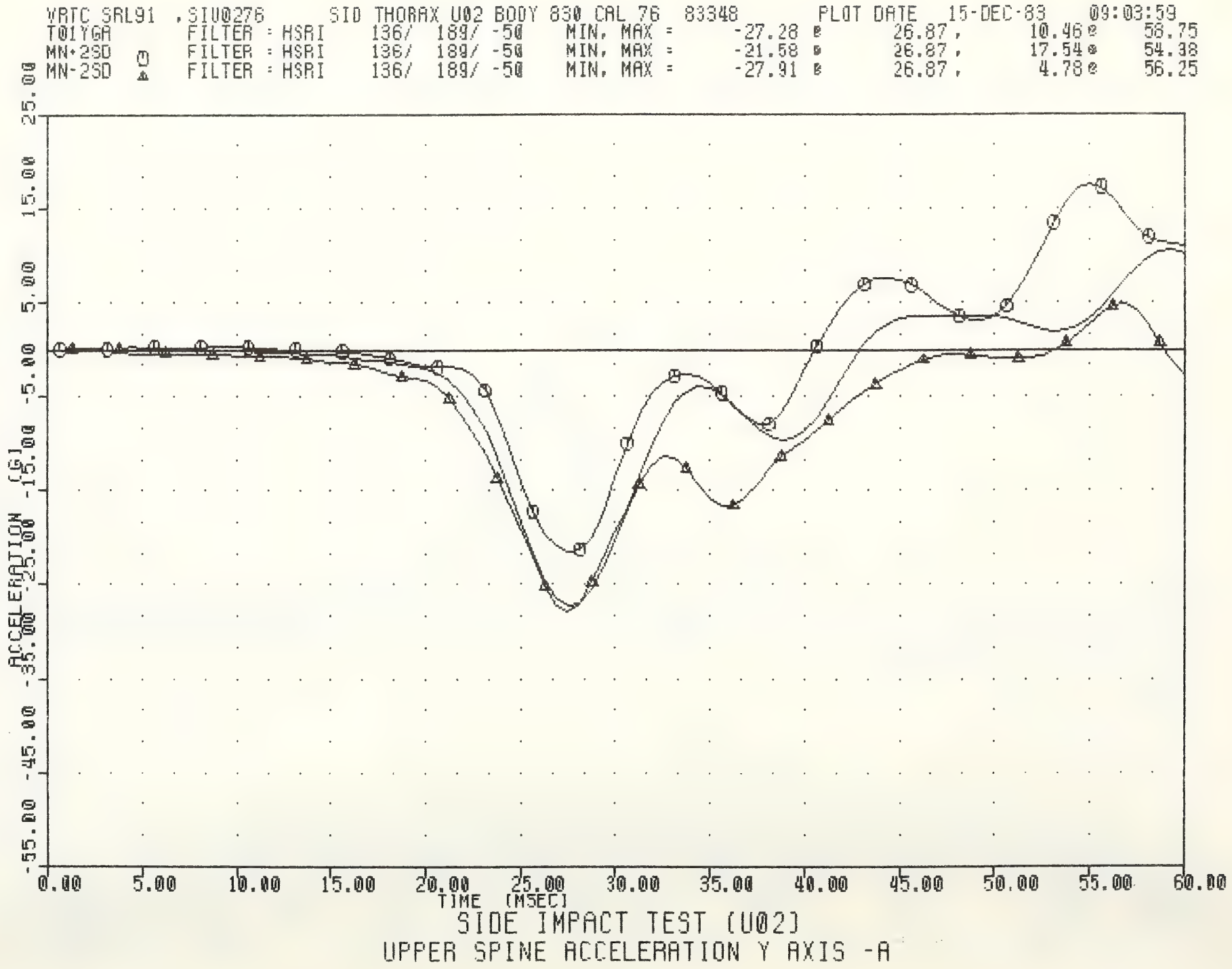
LEFT UPPER RIB ACCELERATION Y AXIS -1



SIDE IMPACT TEST (U02)

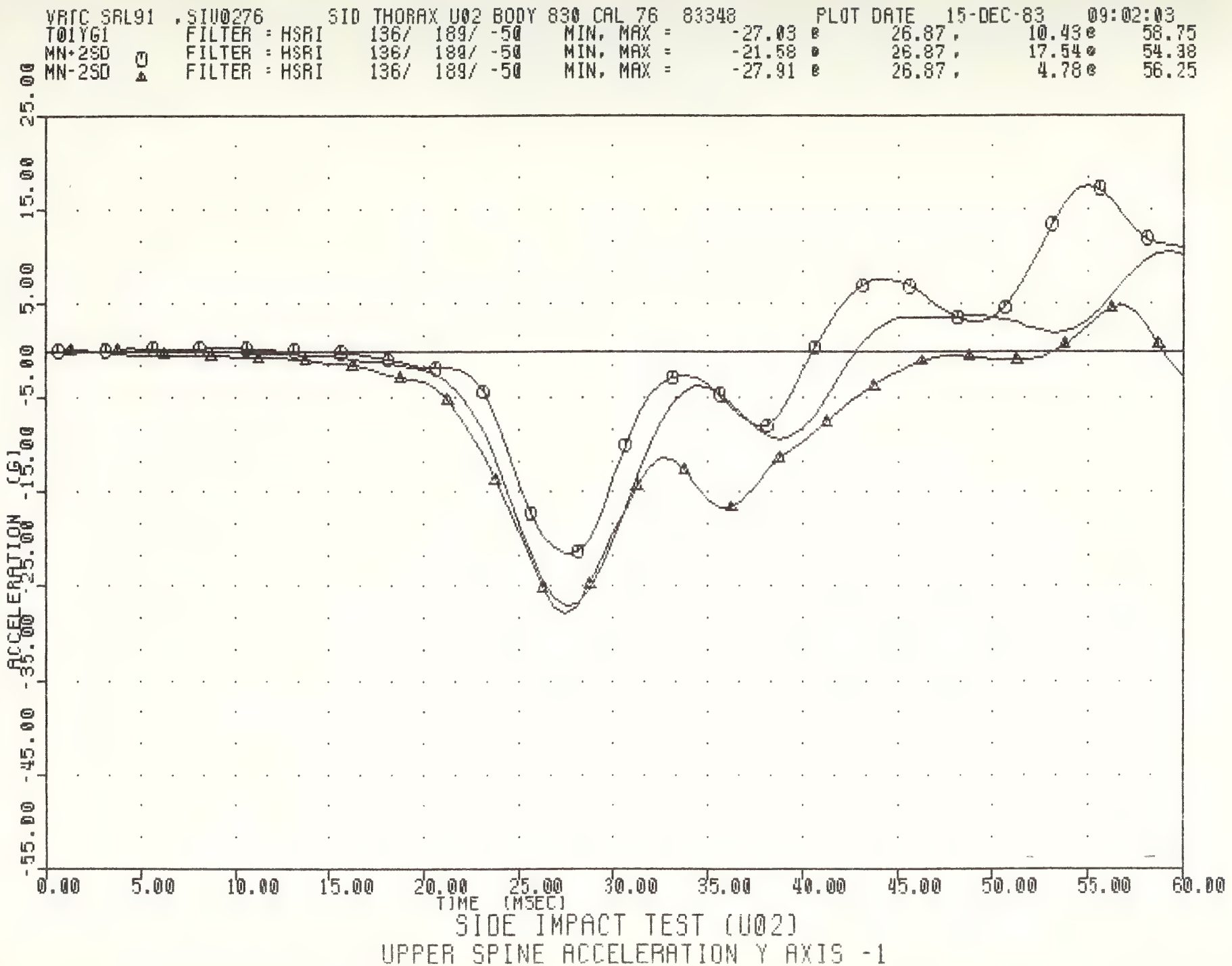
LOWER SPINE ACCELERATION Y AXIS -A


VRTC SRL91 ,SIU0276 SID THORAX U02 BODY 830 CAL 76 83348 PLOT DATE 15-DEC-83 09:05:56
T12YG1 FILTER : HSRI 136/ 189/ -50 MIN, MAX = -25.60 @ 25.63 , 8.69 @ 59.38
MN+2SD FILTER : HSRI 136/ 189/ -50 MIN, MAX = -22.37 @ 25.63 , 13.54 @ 53.75
MN-2SD FILTER : HSRI 136/ 189/ -50 MIN, MAX = -25.64 @ 25.63 , 4.85 @ 53.75
ACCELERATION (G)
25.00
15.00
5.00
-5.00
-15.00
-25.00
-35.00
-45.00
-55.00
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
50.00
55.00
60.00
TIME (MSEC)
SIDE IMPACT TEST (U02)
LOWER SPINE ACCELERATION Y AXIS -1



SIDE IMPACT TEST (U02)

UPPER SPINE ACCELERATION Y AXIS -A



SIDE IMPACT TEST (U02)

UPPER SPINE ACCELERATION Y AXIS -1